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SUPPLY AND COST OF ALTERNATIVES TO MTBE IN GASOLINE

TECHNICAL APPENDICES

Refinery Modeling Task 3:
Supply Scenario Modeling Runs

DECEMBER 1998



CALIFORNIA
ENERGY
COMMISSION

Pete Wilson, Governor

P300-98-013I

*Evaluating the Cost and Supply of Alternatives to MTBE in
California's Reformulated Gasoline*

Final Report

REFINERY MODELING

Task 3: SUPPLY SCENARIO MODELING RUNS

SELECTED OXYGENATE SUPPLY SCENARIOS

Prepared for

California Energy Commission

by

MathPro Inc.

under

Subcontract No. CM6006W3

December 9, 1998

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1.

1. INTRODUCTION

MathPro Inc. submits this final report to the California Energy Commission (CEC) pursuant to Task 3 (for the Refinery Modeling Subcontractor) of Subcontract CM6006W3 (Contract 500-96-012). Task 3 calls for developing intermediate- and long-term Reference Cases and conducting a series of modeling runs of alternative oxygenate Supply Scenarios delineated in the Task 1 report.

Intermediate-term denotes a period during which oxygenate markets adjust to an MTBE-ban-induced change in oxygenate demand, but during which no additional oxygenate production capacity and refining process capacity (other than from debottlenecking) can be brought online. Long-term denotes a period during which oxygenate markets, oxygenate production capacity, and refining process capacity fully adjust to an MTBE ban.

In this report, we examine over sixty Supply Scenarios, covering both the intermediate term and long term, consisting of:

- Reference cases;
- MTBE cases in which HR 630 is assumed passed;
- No Oxygenate cases in which HR 630 is assumed passed; and
- A series of cases in which ethanol, TBA, ETBE, and mixed oxygenates are assumed to be the replacement oxygenates.

We used the calibrated California statewide aggregated refinery model (described in the Task 2 report) as the basis for developing the intermediate- and long-term Reference Cases. We then modified key elements of the Reference Case refinery model representations to assess the implications of an MTBE ban under alternative oxygenate Supply Scenarios. This involved:

- Adjusting the calibrated California refinery model to represent: (1) projected growth in refined product demand in the intermediate term and the long term; (2) growth in refining process capacity necessary to supply future refined product demand; and (3) Phase 2 RFG standards on gasoline supplied to Arizona; and
- Incorporating in ARMS: (1) supply curves for imported oxygenates (ethanol, ETBE, TBA, and TAME), as estimated by ESAI; (2) supply curves for imported CARBOB (for blending with alternative oxygenates) and alkylate, as estimated by Purvin & Gertz; (3) supply curves for imported isomerate, diesel fuel, diesel fuel blendstocks, and jet fuel, as estimated by MathPro; (4) reduced-forms of the Predictive Model for oxygenate levels ranging from 0 to 1.8 wt% and 2.2 to 2.7 wt%; and (5) reduced-forms of the Predictive Model in flat limit operating mode oxygenate levels ranging from 0 to 1.8 wt%, 1.8 to 2.2 wt%, and 2.2 to 2.7 wt%.

These new elements enabled us to represent in ARMS the sets of assumptions defining each of the Supply Scenarios and to assess the effects of an MTBE ban under each of the Supply Scenarios.

The remainder of this report describes the Reference Cases and the results of the refinery modeling for the Supply Scenarios.

2. REFERENCE CASES

2.1 Establishing the Reference Cases

In developing the Reference Cases, we use the year 2002 to represent the intermediate term and the year 2005 to represent the long term.

To develop the Reference Cases, we modified the Calibration Case to account for: (1) growth in refined product demand; (2) increases in refinery capacity necessary for the California refining sector to satisfy projected product demands without importation of finished products; and (3) the shift to federal Phase 2 RFG standards for Arizona gasoline. We also consolidated the crude oil slate into a single composite crude oil with crude oil fractions equal to the weighted average of crude oil fractions in each of the crude oils in the Calibration Case.¹

The projections of refined product demands and refining process capacity are developed in **Exhibits 1 – 3**.

Exhibit 1 shows projected growth rates in California's demand for selected refined products. According to these projections (developed by CEC), demand for gasoline, jet fuel, and CARB diesel fuel will be about 7 to 10% and 13 to 17% higher in 2002 and 2005, respectively, than in Summer 1997 (the calibration period).

Exhibit 2 shows projected refined product demands for 2002 and 2005. We calculated demands for California RFG, jet fuel, and CARB diesel for 2002 and 2005 by multiplying refinery output from the 1997 Calibration Case by the corresponding growth factors shown in Exhibit 1. Projected refinery output of Arizona gasoline and conventional gasoline is calculated using projected growth rates in demand for gasoline in Maricopa County, Arizona. Projected refinery output of conventional gasoline is calculated using the same projected growth rates as for California RFG. Demands for EPA diesel and other distillate fuel oil are calculated using the same projected growth rates as for CARB diesel. Demands for other refined products are calculated using the same growth rate as for jet fuel (1.5% per year).

Exhibit 3 shows aggregate refinery process capacities in the Calibration Case and in the 2002 and 2005 Reference Cases. We assumed sufficient "capacity creep" (from debottlenecking, revamping, and expansion of units) so that the aggregate California refining sector could supply the projected product demands (i.e., no imports of finished products). We used the following procedures to adjust refining capacity in the Reference Cases.

2002 Reference Case. Increase capacity by 5% (1% per year) from the Calibration Case for crude distillation, coking, fluid cat cracking, distillate and gas oil hydrocracking,

¹ We used a single composite crude because: (1) we expected the volume of crude oil purchases to vary across Supply Scenarios; (2) many of the ratio constraints developed for the Calibration case are specified in terms of ratios of certain crude oil fractions; and (3) using a single composite crude ensures that the ratios of purchased crude oil fractions in the Calibration Case are maintained across all Reference and Supply Scenario case, so that ratio constraints need not be re-set on a case-by-case basis.

alkylation, pen-hex isomerization, distillate desulfurization, benzene saturation, hydrogen, and lube oil. Allow ARMS to add capacity (with no capital charge) for debutanization, light naphtha splitting, naphtha and reformer feed desulfurization, distillate dearomatization, and FCC naphtha splitting; and then set limits on capacity 5% higher (except for naphtha and reformer feed desulfurization and distillate dearomatization, which are left unconstrained). Hold capacity constant dimersol, polymerization, reforming, MTBE, TAME, FCC naphtha desulfurization, butane isomerization, and solvent deasphalting.

This procedure results in most process units -- except fluid coking and gas oil hydrocracking (which are tight in the Calibration Case) and some minor processes (such as dimersol, MTBE, TAME, butane isomerization, and solvent deasphalting) -- having some degree of slack capacity in the Reference Case. The slack ranges from about 2 to 5%, but is larger for some process units, such as pen/hex isomerization, reforming, and distillate desulfurization.

2005 Reference Case. Allow ARMS to add capacity (with no capital charge) for crude distillation, fluid cat cracking, distillate hydrocracking; and then set limits on capacity 2% higher. Increase capacity by 8% (1% per year) from the Calibration Case for coking, gas oil hydrocracking, alkylation, pen/hex isomerization, distillate desulfurization, benzene saturation, hydrogen, and lube oil. As in the 2002 Reference Case: (1) allow ARMS to add capacity (with no capital charge) for debutanization, light naphtha splitting, naphtha and reformer feed desulfurization, distillate dearomatization, and FCC naphtha splitting; and then set limits on capacity 5% higher (except for naphtha and reformer feed desulfurization and distillate dearomatization, which are left unconstrained); and (2) hold capacity constant for dimersol, polymerization, reforming, MTBE, TAME FCC naphtha desulfurization, butane isomerization, and solvent deasphalting.

As in the 2002 Reference Case, this procedure allows most process units (with the exceptions noted above) some degree of slack, generally ranging from about 2 to 5%.

Adjusting the capital stock in this manner led to Reference Cases in which: (1) the aggregate California refining sector fully supplies projected refined product demands (i.e., no imports of finished products); (2) the marginal costs of producing refined products are similar to those in the Calibration Case; and (3) the refinery system has some slack, permitting small increases in refined product output before capacity constraints are reached and marginal production costs begin increasing.

We sought these results in the Reference Cases so that the results of the Supply Scenarios would reflect only the cost of a MTBE ban and not any costs of meeting normal demand growth.²

² Other analytical procedures could be used to establish the Reference Cases. For example, they could be developed by assuming no "capacity creep." Instead, ARMS could be used to determine the optimal combination of investment in new process capacity and imports of blendstocks and refined products to meet projected product demands. The addition of new process capacity would be influenced by the investment costs

2.2 Reference Case Results

Exhibits 5 through 9 show the results for the 2002 Reference Case (Intermediate term, MTBE,1) and the 2005 Reference Case (Long term, MTBE,1). The results are similar to those previously reported for the Calibration Case, except for increases in product out turns and capacity utilization..

- **Exhibit 5 (pages 1 & 3)** shows process unit utilization and operations.
- **Exhibit 6A (pages 1& 3)** shows refinery inputs.
- **Exhibit 7 (pages 1 & 2)** shows refinery production of refined product outputs.
- **Exhibit 8 (pages 1 & 4)** shows the properties of CARB, Arizona, and conventional gasoline and the percent change in emissions (% emissions) calculated using the Predictive Model (not the reduced form incorporated in ARMS). Applying the Predictive Model (in averaging mode) to the 1997 summer CEC gasoline quality survey data yields the following % emissions: VOCs -- -0.61; NOx -- -0.49; and toxics -- -0.73. In this analysis, we use a target minimum for % emissions of -0.30 for the Predictive Model in averaging mode, under the assumption that over time refiners would fine tune their operations and move somewhat closer to the Predictive Model emission constraints.³ We set a target minimum of -0.50 for % emissions for cases in which the Predictive Model is used in the flat limit mode, based on information developed by CEC and discussed in Section 3.2.
- **Exhibit 9 (pages 1 & 4)** shows the composition of CARB, Arizona, and conventional gasoline.

specified for incremental capacity expansions -- investment costs could range from a fraction of to the full amount of the investment costs in ARMS for new units. Imports of blendstocks and finished products would depend on the supply curves for such materials and the extent of addition of new process capacity.

This procedure would lead to Reference Cases in which: (1) part of the projected product demands *might* be satisfied by imports; (2) the marginal costs of producing refined products are higher than in the Calibration Case; and (3) the refinery system has no slack permitting small increases in refined product output before capacity constraints are reached and marginal production costs begin increasing. It is likely that establishing the Reference Cases in this way would increase the effects and costs of an MTBE ban in the intermediate term.

³ Changing the Predictive Model minimum emission targets from those calculated for Summer 1997 to -0.30 tends to reduce the costs estimated for an MTBE ban

3. ANALYSIS OF SUPPLY SCENARIOS

MTBE is a key blendstock enabling California refineries to produce gasoline meeting the stringent requirements of the Predictive Model. California refineries have configured their process capacity and operations to accommodate the use of MTBE as a gasoline blendstock.

The California refining sector's response to a ban on the use of MTBE as a gasoline blendstock would be influenced by: (1) the techno-economics of current refinery operations; (2) the extent to which new process capacity is brought on-line in response to an MTBE ban; (3) the availability and price of alternative oxygenates (e.g., ethanol, TBA, ETBE, and TAME); (4) refiners' perceptions of the potential environmental liabilities associated with alternative oxygenates; (5) the availability and price of various refined products (e.g., jet fuel and diesel fuel) and blendstocks (e.g., CARBOB, alkylate, and distillate) that could be used to facilitate the production of or supplement the supply of refined products for the California market; and (6) the ability of refineries to sell blendstocks that would be rejected from gasoline blending (at certain market prices) because of the emission reduction requirements of the Predictive Model.

Assessing the California refining sector's likely response of an MTBE ban is a difficult undertaking. Indeed, CEC specified over 60 distinct Supply Scenarios as part of the effort to evaluate the potential effects of an MTBE ban. Because of the complexity of refining operations and the interplay of multiple technical and economic factors, any comprehensive effort to evaluate the effects of an MTBE ban of necessity must rely on a comprehensive refinery LP model, such as ARMS, that:

- Adequately represents refining operations under current regulatory standards;
- Incorporates the techno-economics of the most important refining processes, along with the flexibility of the refining sector to modify process operations in response to new circumstances;
- Represents the constraints imposed by the Predictive Model on gasoline blending;
- Allows for various responses to an MTBE ban -- such as importing desirable blendstocks, CARBOB, and finished products, and exporting undesirable blendstocks -- that are not now practiced because they are uneconomic under the current regulatory regime; and
- Has the flexibility to represent the sets of assumptions CEC has used to define each of the Supply Scenarios.

This section briefly discusses: (1) the enhancements we made to ARMS to allow representation of each of the Supply Scenarios and to capture the interaction of technical and economic factors influencing the refining sector's likely response to an MTBE ban; (2) operating modes (averaging or flat limits) in the Predictive Model; (3) the approach for

assessing the effects of an MTBE ban under each Supply Scenario; and (4) the results of a first set of refinery model runs assessing certain Supply Scenarios.

The factors defining each of the Supply Scenarios examined -- replacement oxygenate, period of analysis, MTBE ban region, and other policies – are shown in **Exhibit 4**, along with a summary of the modeling assumptions used to configure ARMS. The Supply Scenarios listed under the heading “Supplement” were examined at the request of CEC after considering comments of participants at the Commission’s public hearing on November 13,1998.

The Supply Scenarios generally are set up so that the entire CARB gasoline pool is produced using a specific oxygenate (or no oxygenate), i.e., all ethanol or all TBA. This is a useful *analytic construct* for developing information on the costs and refinery technical responses associated with the use of alternative oxygenates to replace MTBE. Such information provides insights regarding the likely response by the California refining sector to an MTBE ban, which could involve the use of multiple replacement oxygenates (depending on perceived environmental liabilities) or no use of oxygenates for a portion of the gasoline pool.

In practice, individual refineries could pursue different strategies, given their differences in refining capabilities and possible differences in oxygen content minimums for northern and southern California.

3.1 Enhancements to ARMS

To conduct the Supply Scenario analysis, we modified and enhanced ARMS as follows:

- Total refined product demand. Established constraints setting projected demand for selected refined products (CARB gasoline, jet fuel, CARB diesel fuel, and EPA diesel fuel) equal to the sum of refinery production and imports.
- Oxygenate supply. Represented oxygenate supply functions (MTBE, ethanol, TBA, ETBE, and TAME) developed by ESAI.
- CARBOB supply. Represented CARBOB supply functions developed by Purvin & Gertz and established recipe blending of CARBOB with specified oxygenates. (We established three recipe blends for ethanol, representing blending to 2.1, 2.7, and 3.5 wt% oxygen.)
- Alkylate supply. Represented alkylate supply functions developed by Purvin & Gertz and set the ratio of propylene alkylate and butylene alkylate in imported alkylate at 40/60. (Alkylate import volumes in the Supply Scenarios are in addition to alkylate imports volumes specified in the Reference Cases.)
- Other inputs.

- Represented isobutane supplies comprising (1) a maximum of 12 K bbl/d of imports (the volume of inputs for Summer 1997 reported by CEC) at \$22.19/bbl (the average reported price for Summer 1997) and (2) unlimited imports at \$24.36/bbl (about 13¢/gal higher than average reported Gulf Coast prices for Summer 1997).
- Allowed imports of isomerate as follows: 10 K b/d each at \$26/bbl, \$27/bbl, and \$28/bbl. Given Gulf Coast refining pen/hex isomerization capacity of about 170 K b/d, it is likely that limited volumes of isomerate could be supplied by Gulf Coast refineries to California. We estimated the initial supply price for isomerate by adjusting the Gulf Coast price of regular gasoline downward to account for the value of the octane differential between isomerate and regular gasoline and then adding about \$4/bbl transportation costs and \$1/bbl for miscellaneous costs and margin. We increased the price for larger supplies of isomerate to reflect increases in its marginal value to Gulf Coast refiners as it is removed from their gasoline pool.
- Allowed distillate blendstock imports at \$25.50/bbl (about 9¢/gal higher than average reported Gulf Coast prices for Summer 1997).
- Allowed EPA diesel fuel imports at \$25.80/bbl (about 9¢/gal higher than average reported Gulf Coast prices for Summer 1997).
- Allowed jet fuel imports at \$26.50/bbl (about 9¢/gal higher than average reported Gulf Coast prices for Summer 1997).
- Did not allow imports of CARB diesel, i.e, we required the entire volume of projected demand for CARB diesel to be produced by the California refining sector.
- Assumed flat “supply” curves for iso-butane, distillate blendstocks, EPA diesel, and jet fuel. The import volumes of these streams are small relative to the size of Gulf Coast and world markets.
- Oxygenate properties. Established three ethanol streams to distinguish the effects on gasoline distillation curves of blending ethanol to 2.1, 2.7, and 3.5 wt% oxygen.⁴ Properties for the ethanol streams and other oxygenates are shown in Appendix A (at the end of this report).
- Predictive Model.
- Added a reduced form of the Predictive Model for CARB gasoline with oxygen

⁴ The blending properties are developed in a memorandum entitled “Ethanol Blending Properties for Task 3 Modeling Work” from MathPro to Gordon Schremp, CEC, June 30, 1998.

- content ranging from 0 to 1.8 wt % and 2.2 to 3.5 wt%.
- Added reduced forms of the Predictive Model in flat limits mode for oxygen content ranging from 0 to 1.8 wt%, 1.8 to 2.2 wt%, and 2.2 to 3.5 wt%.
 - Export of rejected gasoline blendstocks. Allowed for the export of gasoline blendstocks at the following prices: mixed butylenes -- \$12.00/bbl; pentanes -- \$12.60/bbl; light coker naphtha -- \$13.00/bbl; and light FCC gasoline, heavy FCC gasoline, virgin naphtha (250 – 325 °F) and heavy reformate -- \$15.00/bbl.⁵

With these enhancements, we configured ARMS to represent each Supply Scenario and used it (as described in the next section) to find an “optimal solution” in which: (1) projected product demands are met with the lowest cost combination of refinery production (from crude oil, specified purchased inputs, and imports of blendstocks), imports of refined products (CARBOB blended with oxygenates, jet fuel, and diesel fuel), and sales of rejected blendstocks; and (2) requirements of the Predictive Model for CARB gasoline, requirements of the Complex Model for Arizona gasoline, and all other refined product specifications are met.

3.2 Predictive Model Operating Modes

Refiners may use the Predictive Model in *averaging* mode or in *flat limits* mode. Further, they may use averaging mode for some properties and the flat limit mode for others. In averaging mode, refiners must use the measured properties of a given batch of gasoline when running the Predictive Model. In flat limits mode, refiners specify per gallon limits for each gasoline property (or for a subset of properties); the measured properties for a given gasoline batch must not exceed these specified limits. Refiners may modify frequently the flat limits governing their gasoline production.

The Predictive Model, when run in the flat limit mode with CARB’s specified flat limits and when run in the averaging mode with CARB’s specified averaging limits, yields the same % emissions (at the specified limits, % emissions are zero). The CARB-specified flat limits, averaging limits, and the “deltas” between them are shown in the table below.

CARB-Specified Flat Limits, Averging Limts, and “Deltas”

Property	Flat Limits	Averaging Limits	“Deltas”
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⁵ In situations where heavy reformate is rejected from the gasoline pool, refineries presumably would sell reformer naphtha feed, rather than incurring the cost of reforming the material and then rejecting reformate. We allowed ARMS to sell most heavy reformate feeds. However, in two intermediate term No Oxygenate cases, ARMS would reject virtually all heavy reformate feeds and, because we did not allow some heavy reformate feeds to be sold, ARMS rejects heavy reformate instead. This slightly increases the cost associated with the intermediate term no oxygenate cases.

Aromatics (vol%)	25.0	22.0	3.0
Benzene (vol%)	1.00	0.80	0.20
Olefins (vol%)	6.0	4.0	2.0
Sulfur (ppm)	40	30	10
T50 (°F)	210	200	10
T90 (°F)	300	290	10

If the average properties of a gasoline pool diverge from CARB's specified averaging limits, the Predictive Model yields different % emissions when run in the averaging mode -- with the average pool properties -- and in the flat limits mode -- with the average pool properties plus each of the above deltas. This is shown in the table below, where: (1) the average gasoline properties differ from CARB's specified averaging limits; and (2) the flat limit properties differ from average properties by the above deltas. The difference in % emissions is most marked for VOCs. Because the Predictive Model behaves in this manner, we estimated reduced-form versions of the Predictive Model in flat limits mode.

Comparison of Emissions for Flat Limit vs. Averaging Mode

	Flat Limits	Measured Properties
Properties		
RVP (psi)	6.8	6.8
Oxygen (wt%)	2.1	2.1
Aromatics (vol%)	24.0	21.0
Benzene (vol%)	0.80	0.60
Olefins (vol%)	5.5	3.5
Sulfur (ppm)	35	25
T50 (°F)	205	195
T90 (°F)	295	285
Mode	Flat Limits	Averaging
% Emissions		
VOCs	-2.62	-1.71
NOx	-.37	-.35
Toxics	-6.49	-6.38

In general, refiners may use the flat limit mode to their advantage if they can establish flat limits that are closer to measured properties for gasoline batches than the deltas reported

above. Further, the closer refiners can bring actual measured gasoline properties to the reported flat limits, the greater the advantage to using the flat limit mode.

At our request, CEC analyzed the flat limits reported by refiners in Summer 1997 and compared them to the average gasoline properties reported by the same set of refiners in the CEC gasoline survey. Shown below is the weighted average difference (i.e., flat limit minus average property) between each flat limit and average gasoline property, by grade and for the entire gasoline pool and % emissions corresponding to the set of weighted average reported flat limits, by grade.

Based on these results, we calculate flat limits for each gasoline property (for the entire CARB gasoline pool) as the sum of the average property calculated in ARMS *plus* the deltas shown above. For example, if the average aromatics content of CARB gasoline in ARMS is 20%, the flat limit for aromatics used in the Predictive Model is calculated as $20\% + 1.9\% = 21.9\%$. Flat limits for other properties are calculated similarly. We also set target minimums for % emissions at -0.50 based on the results of CEC's analysis and discussions with refiners regarding operational capabilities.

Comparison of Flat Limits and Average Properties and % Emissions

	Premium	Regular	Pool
Flat Limit minus Average Property			
Aromatics	2.2	1.8	1.9
Benzene	0.25	0.13	0.15
Olefins	2.3	1.7	1.8
Sulfur	4.8	5.0	5.0
T50	4.6	4.9	4.8
T90	8.5	7.1	7.4
% Emissions			
VOCs	-0.76	-0.77	
NOX	-0.44	-0.25	
Toxics	-0.99	-0.62	

With this specification, using the Predictive Model in the flat limits mode is especially advantageous for T50 and aromatics control.

3.3 Methodology

The analytic approach for conducting the refinery modeling of the Supply Scenarios was as follows.

- Supply curves. We changed the oxygenate, CARBOB, and alkylate supply curves from scenario to scenario to reflect the factors defining each Supply Scenario (e.g., the replacement oxygenate, the time period of analysis, the MTBE ban region, the availability of ethanol incentives, etc.). We assumed that the supply curves for CARBOB and alkylate were independent of one another, that is, changing the volume of alkylate imports does not affect the availability of CARBOB imports. To the extent that alkylate and CARBOB supplies are linked, i.e., increasing imports of alkylate reduce the availability of CARBOB, some of the model runs, particularly those for the intermediate term, may overstate the combined availability of alkylate and CARBOB.

We used the same supply curves for isomerate, distillate blendstocks, jet fuel, and EPA diesel fuel across all Supply Scenarios.

- Environmental liabilities. The supply curves for MTBE (and other oxygenates) are based on production costs (or the value of oxygenates in alternative uses) and the cost of transporting oxygenates to California. We did *not* incorporate in the MTBE (or other oxygenate) supply curves any adjustment for potential refiner liability stemming from ground water contamination. Consideration of such potential costs would increase the “implicit cost” to refiners of blending MTBE (or other oxygenates) in gasoline and likely would result in less use of MTBE than indicated in our analysis.
- Period of analysis. Modeling of all intermediate term Supply Scenarios is based on the 2002 Reference Case. In the intermediate term, only minor capacity expansions, such as through debottlenecking, are allowed. We model this assumption by allowing up to a 5% increase in capacity (with full investment costs) for existing units, but no capacity additions beyond that and no additions of new units.

Modeling of all long term Supply Scenarios is based on the 2005 Reference Case. In the long term scenarios, refining capacity is added as needed at full investment cost.

- RVP Adjustments. In the “no ethanol RVP waiver cases,” we set the RVP constraints for CARB RFG to 5.5 psi and the RVP of ethanol to 5.5 psi. Given the 1.3 psi increase in RVP associated with blending ethanol into 5.5 psi gasoline, the RVP of the finished ethanol-blended CARB RFG would be about 6.8 psi.

In the “1 psi RVP waiver cases,” we set the RVP constraints for CARB RFG to 6.5 psi and the RVP of ethanol to 6.5 psi. Assuming a 1.3 psi increase in RVP associated with blending ethanol into 6.5 psi gasoline, the RVP of the finished ethanol-blended CARB RFG would be about 7.8 psi.

In the “ethanol/business as usual/national MTBE ban cases,” we assumed that ethanol would be blended in Arizona RFG. We modified the coefficients of the reduced form of the Complex Model such that a RVP of 5.5 psi corresponds to 6.8 psi in terms of emission reductions.

- TBA, ETBE, and Mixed Oxygenate Cases. We allowed the replacement oxygenate(s), along with MTBE, to be blended in Arizona and conventional gasoline.
- Alkylate supply. We modified the volume of alkylate available in several ethanol cases to investigate the sensitivity of modeling results to changes in prospective alkylate supply. In particular, we ran cases in which the supply of imported alkylate was limited to 175 K bbl/d, 50 K bbl/d, and 100 K bbl/d. Alkylate supply for other “California MTBE Ban” cases and “National MTBE Ban” cases were limited to 100 K bbl/d and 75 K bbl/d, respectively.
- Ethanol blending. For all cases in which ethanol receives a tax credit, we assumed that ethanol blending would be either at 6 vol% (2.1 wt% oxygen) or 7.8 vol% (2.7 wt% oxygen), because the tax credit is available only for ethanol blended at those specified percentages. To determine the extent of ethanol blending in a given Supply Scenario, we ran (at least) two cases: one in which the oxygen content of CARB RFG was constrained to 2.1 wt%, the other in which it was constrained to 2.7 wt%. Comparison of the objective functions for the two cases indicated the preferred level of ethanol blending.

We also ran variants for the intermediate term and long term in which we assumed a continuous ethanol tax credit is available to refiners, i.e., ethanol could be blended anywhere from 2.2 to 2.7 wt% oxygen. ARMS blended ethanol to 2.7 wt% oxygen in both cases.

- Imports of CARBOB. Because of modeling complexities presented by the Complex and Predictive Models, ARMS is set up so that the volume of refinery gasoline production must be specified. CARBOB (adjusted for oxygenate blending) is then imported to make up the difference between refinery gasoline out-turns and demand. Thus, we conducted a series of iterative model runs for each ethanol Supply Scenario to determine the “optimal” combination of refinery production of CARB RFG and imports of CARBOB. (The number of runs could be as few as two for cases in which no CARBOB imports were called for.)
- Predictive Model % Emissions. Because ARMS incorporates a reduced form of the Predictive Model, not the actual model, the % emissions calculated in ARMS for a given set of gasoline properties may differ somewhat from the % emissions calculated using the Predictive Model for the same set of gasoline properties. To resolve discrepancies, we ran ARMS iteratively, generally twice, such that % emissions calculated with the Predictive Model closely matched the minimum targets, -0.30 or -0.50, depending on the operating mode. (The % emission reduction for one or more emission categories sometimes is significantly greater than the targets, particularly for toxics, if controlling one emission category to the minimum target effectively controls emission reductions for other emission categories.)

3.4 Results of Model Runs

Exhibits 5 to 9 show the results of model runs for each of the Supply Scenarios.

Exhibit 10 provides a summary of key results for each of the cases in terms of costs, investment, imports of blendstocks and refined products, sales of rejected blendstocks, and capacity utilization rates. Exhibit 10 includes several cost categories:

- **Variable cost** equals the difference between the estimated cost in ARMS of supplying projected refined product demand in the Reference Case and the given Supply Scenario case, not including any capital charges, ancillary costs, or infrastructure costs. Factors accounted for in this cost category are operating costs; costs of crude oil inputs, imported blendstocks, and imported refined products; sales of rejected blendstocks; and energy purchases.
- **Refinery capital charges** are the annualized costs associated with investments made by refineries to expand or add new refining process capacity.
- **Ancillary refining costs** are costs that refineries may incur under an MTBE ban, but that are not registered in a refinery LP model (ARMS, in this instance). Refinery LP models do not register ancillary costs not because they are imaginary, but because it is hard to express them as explicit functions of refinery operating variables. The primary cost elements comprising ancillary costs in this study include additional blendstock tankage and inventory, over-optimization due to the profusion of blendstocks in ARMS, over-optimization because compliance with the Predictive Model is required for the gasoline pool rather than for each gasoline grade, and over-optimization because of the use of an aggregate refinery model to represent the California refining sector. Ancillary costs are estimated as 0.1 ¢/gal (for blendstock tankage and inventory) plus 15% of variable costs and capital charges. Thus, ancillary costs are roughly proportional to refining costs calculated in ARMS for each Supply Scenario and are highest for the highest cost scenarios.
- **Logistics costs** are the annualized terminal and transportation costs associated with ethanol blending.
- **Mileage loss** is the cost of producing and distributing (not including federal or state taxes) the additional gasoline needed because of the mileage loss, if any, of replacing MTBE with alternative oxygenates. We assume the mileage loss is directly proportional to changes in gasoline energy density.

We did not consider possible reductions in disbursements from the Highway Trust Fund to California due to ethanol blending and the consequent reduction in California's gasoline tax contributions to the Fund.

The results of the analysis indicate, *given assumptions regarding supply and demand curves,*

that: (1) in the long term, allowed the opportunity to modify operations and invest in new capacity, the refining sector could shift to alternative oxygenates with modest cost increases; (2) in the intermediate term, shifting to ethanol is costly and disruptive to refining operations; (3) in the intermediate term, shifting to ethanol is more costly than shifting to other oxygenates; (4) passage of H.R. 630 would be beneficial to refiners; and (5) use of the Predictive Model in flat limits mode reduces the cost associated with shifting to alternative oxygenates or using no oxygenate. We discuss selected Supply Scenarios in more detail below.

3.4.1 Ethanol: HR 630 Cases

Ethanol cases in which HR 630 is assumed to be passed have results that are the same ethanol cases in which a minimum of 2.1 wt% oxygen is required. Our analyses indicate that the combination of the RVP effect of ethanol on gasoline (which is roughly invariant with respect to the percentage of ethanol blended in gasoline), the estimated laid in prices of ethanol to California refineries, and the attributes of the Predictive Model are likely to lead refiners to blend ethanol up to the maximum allowed in the Predictive Model (2.7 wt% oxygen), if ethanol is selected as the replacement oxygenate.

3.4.2 Ethanol: RVP Waiver Cases

Ethanol cases in which a 1 psi RVP waiver applies to CARB RFG are infeasible under the averaging mode in the Predictive Model for both the intermediate and long term and feasible, but high cost, under the flat limit mode in the Predictive Model for the intermediate term. The reason for infeasibility under the averaging mode is that the Predictive Model shows a very large NOx penalty for high oxygen content (3.5 wt%) gasoline.

Under the Predictive Model in averaging mode, a complying gasoline with 3.5 wt% oxygen must have a sulfur content of around 10 ppm, an olefin content of less than 1.0 vol%, and an aromatics content of less than 15 vol%. ARMS cannot “produce” significant volumes of a gasoline with these extraordinary properties. It also is unlikely that significant volumes of imported, CARB-compliant CARBOB would be available for blending with ethanol to 3.5 wt% oxygen.

Under the flat limit mode, ARMS can “produce” complying gasoline, primarily because the flat limits mode allows higher aromatics content (around 23 vol%). However, the complying gasoline “produced” by ARMS has an olefins content of less than 1.0 vol% and a sulfur content of less than 10 ppm. The primary source of sulfur and olefins in gasoline is FCC naphtha. Hence, to produce a gasoline with extremely low sulfur and olefins content would require refiners either to limit the volume of FCC naphtha blended to gasoline or to further reduce the sulfur and olefins content of FCC naphtha. Our aggregate model of the California refining sector combines two different types of treatment trains now used to control the sulfur and olefins content of FCC naphtha: the first is conventional hydrotreating of FCC feed, followed by hydrotreating FCC naphtha; and the second is deep hydrotreating of FCC feed,

which results in a relatively low sulfur/olefins content FCC naphtha. Thus, it is likely that our aggregate refining model could exercise refining options unavailable to refiners with specific treatment trains for FCC feed and FCC naphtha.

To deal with this problem, we developed two additional refining models, identical in most respects, except that one incorporates conventional FCC feed hydrotreating and FCC naphtha hydrotreating and the other incorporates deep FCC feed hydrotreating. The results of our analyses for the intermediate term (flat limits) indicate that it would be costly and possibly infeasible for refineries that employ deep FCC feed hydrotreating to control gasoline sulfur and olefins content to produce complying gasoline. Our modeling indicates that it would be less costly for refineries with conventional FCC feed desulfurization and FCC naphtha desulfurization to produce complying gasoline. However, these results hinge on the presence of excess FCC naphtha hydrotreating capacity and are sensitive to the properties of treated FCC naphthas. It may well be that specific refineries with this type of treatment train may be unable to produce complying gasoline. Also, it is not clear whether imports of complying CARBOB would be available in significant volume.

3.4.3 Ethanol: RVP Waiver and Flat Limit Recipe Cases

CEC requested that we estimate total average per gallon costs for additional intermediate-term and long-term Supply Scenarios in which an RVP waiver is granted for ethanol, ethanol is blended to 3.5 wt% oxygen in CARB gasoline, and limits on all other Predictive Model properties are the flat limits specified for CARB gasoline ("recipe" flat limits). The results of our analysis are shown in **Exhibits 5 to 10** in the "Supplement" sections.

To analyze these cases, we set limits on the average properties of CARB gasoline that are lower than the "recipe" flat limits to reflect that refiners would impose "safety margins" to insure compliance of most gasoline batches with flat limit standards. We initially used as safety margins the "deltas" estimated by CEC and reported in section 3.2 above, i.e., we set average properties equal to the flat limits minus the "deltas" estimated by CEC. However, given initial modeling results and the significant cost associated with the safety margin for T90, we reduced the safety margin for T90 from 7.4 °F to 5.0°F in subsequent model runs.⁶

We report % emission in Exhibit 8 in two ways. In the first, we use the average properties of CARB gasoline in ARMS in the Predictive Model in the averaging mode. In the second, we use the "recipe" flat limits, except that we set the oxygen content at 3.5 wt%. With averaging, the CARB gasoline "produced" by ARMS complies with Predictive Model VOC and toxics % emission standards (by a wide margin), but fails on NOx % emission standards. The "recipe" flat limits comply with Predictive Model VOC % emission standards, but fail on NOx and toxics % emission standards.

⁶ We observed that the cost of T90 (E300) control was high, but that there was significant give-away in T50 (E200). Given this initial result, we thought it appropriate to reduce the safety margin for T90 (E300) because of the economic incentives refiners would have to better control the variability of T90 (E300) across gasoline batches.

3.4.4 Ethanol: U.S. MTBE Ban/No Tax Subsidy Cases

CEC requested that we estimate total average per gallon costs for an additional long-term Supply Scenario, under the averaging and flat limits modes, in which ethanol is the replacement oxygenate, there is a U.S. ban on MTBE blending in gasoline, and there is no ethanol tax subsidy.

Estimates of the total average per gallon costs for a similar Supply Scenario, but in which ethanol retained its subsidy, are shown in **Exhibit 10** and are follows: averaging mode – 3.7¢/gal; and flat limit mode – 3.5¢/gal. Assuming that ethanol continues to be blended at 2.7 wt%, the price increase for ethanol from about 75¢/gal to \$1.27/gal (according to ESAI supply curves) due to loss of the subsidy would raise total average per gallon costs by about 4¢/gal. Thus, an upper bound on total average costs would be about 7.7¢/gal for the averaging mode and about 7.5¢/gal for the flat limit mode. Given the large increase in the price of ethanol, it is likely that refiners would reduce the extent to which it would be blended in CARB gasoline. Assuming ethanol was blended at 2.1 wt%, the loss of the subsidy would raise total average per gallon costs by about 3.1¢/gal. Thus, a lower bound on total average costs would be about 6.8¢/gal for the averaging mode and about 6.6¢/gal for the flat limit mode.

3.4.5 Limits on Alkylate Availability

CEC also requested that we assess how limits on the availability of alkylate and CARBOB would affect the cost and feasibility of producing CARB gasoline without oxygenates and with ethanol as the replacement oxygenate.

The results of four long-term cases are shown in Exhibits 5 to 10, where we set alkylate (and CARBOB) imports to zero (except for 11 K bbl/d of baseline alkylate imports). Our analysis indicates that restricting alkylate imports raises the per gallon costs of banning MTBE and increases the investments the refining sector must make to produce projected volumes of CARB-compliant gasoline. That is, given sufficient time to modify their capital stock, California refiners could produce projected volumes of CARB gasoline without recourse to imports of gasoline blendstocks or finished gasoline, but at higher cost.

In the intermediate-term cases, however, substantial volumes of imported alkylate (or CARBOB) are necessary for the California refining sector to supply projected volumes of CARB gasoline (i.e., there was no feasible modeling solution without substantial volumes of alkylate or CARBOB).

We undertook a series of model runs to assess the value to the California refining sector of

alkylate imports in the intermediate- and long-term for cases in which CARB gasoline is produced with no oxygenate and with ethanol as the replacement oxygenate. In the initial model run for each case, we allowed unlimited imports of alkylate, but no CARBOB, at a price of \$34.23/bbl (consistent with the supply curves developed by Purvin & Gertz).⁷ We then increased the price of alkylate, as shown in the table below, to determine the price sensitivity of refinery demand for alkylate in the various intermediate- and long-term cases.

The results of the analysis indicate that refinery demand for alkylate (or blendstocks with properties similar to alkylate) is: (1) insensitive to price in the intermediate term, i.e., production of CARB gasoline in requisite volumes requires importation of gasoline blendstocks, such as alkylate, with properties favored by the Predictive Model; and (2) moderately sensitive to price in the long-term, i.e., refiners can reduce requirements for imported gasoline blendstocks through investment in new process capacity, particularly alkylation, and the use of olefin maximizing catalysts.

Estimated Price/Volume Relationships for Alkylate for Various Supply Scenarios

Oxygenate	Predictive Model Mode	Intermediate Term		Long Term	
		Price (\$/bbl)	Volume (K bbl/d)	Price (\$/bbl)	Volume (K bbl/d)
No Oxygen	Averaging	34.23	234	34.23	177
		44.23	228	36.73	152
		54.23	217	39.23	34
		74.23	204	41.14	0
	Flat Limits	34.23	173	34.23	100
		44.23	162	36.73	93
		54.23	154	39.23	51
		74.23	139	40.70	0
Ethanol	Averaging	34.23	142	34.23	113

⁷ Through numerous model runs, we established that ARMS yields similar objective functions for cases in which: (1) alkylate imports are limited to 100 K bbl/d and imports of CARBOB are optimized; or (2) no CARBOB imports are allowed and imports of alkylate are optimized. Thus, by eliminating CARBOB imports from the analysis we were able to focus the analysis on alkylate.

		44.23	127	36.73	91
		54.23	121	39.23	45
		74.23	119	40.60	0
	Flat Limits	34.23	117	34.23	86
		44.23	108	36.73	67
		54.23	101	39.23	49
		74.23	95	40.68	0

4. INTERPRETING THE RESULTS OF THE REFINERY MODELING

For each Policy scenario, the refinery modeling analysis estimated the average cost, per gallon of CARB gasoline, of a rule barring MTBE blending. These costs represent economic resources expended in California to supply gasoline without MTBE. They do not necessarily translate into corresponding changes in consumer prices for gasoline.

This section discusses the nature of the economic results of the refinery modeling analysis and how they should be interpreted with respect to estimated costs of an MTBE ban and attendant changes in prices of gasoline (and other refined products).

4.1 Costs

In the refinery modeling analysis, we estimated the costs – for the Summer season – of an MTBE ban (that is, a ban on the use of MTBE as a gasoline blendstock), under various Policy scenarios (e.g., no oxygenate usage, ethanol as the oxygenate of choice, etc.).

The costs of an MTBE ban are the additional costs that the California refining sector would incur in meeting projected demands for refined products through internal production and importation of refined products and blendstocks.⁸

In this report, we present estimated costs in two ways (see Exhibit 10):

- Total seasonal costs: \$MM per Summer season, and
- Total average costs: ¢ per gallon of gasoline.

Total average costs are simply total seasonal costs divided by total volume of (MTBE-free) gasoline produced in a Summer season.

⁸ These costs include the cost of mileage (i.e., fuel economy) loss associated with an MTBE ban. Producing gasoline without MTBE may lead to a small reduction in the gasoline's energy content, with an attendant loss in fuel economy. For any given level of gasoline demand – as measured in vehicle miles traveled – reducing the energy content and fuel economy of gasoline would call for additional volumes of gasoline supply.

Expressed either way, these additional costs – incurred by California as a whole (refining companies, consumers, etc.) – measure the economic resources that would be expended to comply with a ban on MTBE blending. (In economics parlance, they are “social costs”.)

They apply to steady-state market conditions in an average Summer – that is, they do not include transient costs that might be incurred in periods of temporary market disruption, caused by (say) supply interruptions or shortages of imported products or blendstocks.

4.2 Prices

We did not estimate effects of an MTBE ban on market prices in California for gasoline (and other refined products).

Under steady-state conditions, *marginal* costs of supply – as opposed to *average* costs – exert a strong influence on market prices. Changes in marginal costs of gasoline supply caused by an MTBE ban would be a key determinant of subsequent changes in market prices of gasoline (and other refined products).⁹

In the **intermediate term**, before refiners have had time to add new refining capacity, imports would constitute the marginal supply of CARB gasoline (as well as EPA diesel fuel, and jet fuel). The marginal cost of gasoline supply would be the CIF (delivered) price of imported CARB gasoline. This price would likely be the primary determinant of gasoline prices.

In the **long term**, with sufficient new refining capacity in place, California refiners could meet demand without significant import volumes. The marginal cost of gasoline supply would be the marginal cost of production – including return on investment – in the California refining sector. This marginal cost would likely be the primary determinant of gasoline prices – unless the California refineries had created excess gasoline-making capacity by “over-investing”. In this instance, only part of the marginal cost of production – “out of pocket costs”, but not return on investment – would be embodied in gasoline prices.

(Using results of the refinery modeling analysis, we can derive estimates of the marginal costs of gasoline supply for each Policy scenario. This step was beyond the specified scope of the refinery modeling analysis.)

⁹ In general, the *marginal* cost, associated with the “last barrel” supplied, is greater than the *average* cost of all volumes supplied. (Here, supply denotes both in-state production and imports of gasoline and other refined products.)

**Exhibit 1: Projected Growth Rates for Refined Product Demand,
1998 - 2005**

Year	Annual Growth Rate (%)			Cumulative Growth Factor		
	CARB Gasoline	Jet Fuel	CARB Diesel	CARB Gasoline	Jet Fuel	CARB Diesel
1998	1.4	1.5	2.3	1.014	1.015	1.023
1999	1.3	1.5	2.0	1.027	1.030	1.043
2000	1.3	1.5	2.2	1.041	1.046	1.066
2001	1.4	1.5	1.8	1.055	1.061	1.086
2002	1.7	1.5	1.4	1.073	1.077	1.101
2003	1.7	1.5	1.6	1.091	1.093	1.118
2004	2.0	1.5	2.4	1.113	1.110	1.145
2005	2.1	1.5	2.4	1.136	1.126	1.173

Source: California Energy Commission.

**Exhibit 2: Projected California Demand for Refined Products --
2002 and 2005**

Output	Volume (K bbl/d)			
	Refinery Production		Projected Demand (1)	
	Reported 1997	Calibration 1997	2002	2005
Liquified Refinery Gases	67	65	70	74
Propane	33	33	36	37
Propylene	2	2	2	2
Butane	27	27	29	30
Isobutane	1	-	-	-
Mixed Butylenes	4	3	4	4
Special Naphthas	1	-	0	-
Motor Gasoline	1,087	1,087	1,166	1,235
California RFG	899	899	965	1,022
Premium	188	225	241	255
Mid-grade	80	-	-	-
Regular	631	674	723	766
Arizona RFG (2)	56	56	64	68
Premium	14	14	16	17
Regular	42	42	48	51
Conventional (3)	132	132	150	161
Premium	26	26	28	30
Regular	106	106	113	120
Aviation Gasoline	5	5	5	6
Kerosene Jet Fuel (4)	296	296	319	333
Distillate Fuel Oil	292	293	323	344
CARB Diesel	174	174	192	204
EPA Diesel	103	104	114	122
Other	15	15	17	18
Residual Fuel Oil (5)	85	51	55	57
Under 0.31% sulfur	3	-	-	-
0.31% to 1.00% sulfur	23	-	-	-
Over 1.00% sulfur	60	-	-	-
Petrochemical Feedstocks	9	3	3	3
Naphtha < 401 °F	2	3	3	3
Other Oils > = 401 °F	7	-	-	-
Lubricants	19	22	24	25
Wax	3	-	-	-
Asphalt and Road Oil	7	-	-	-
Petroleum Coke (Marketable)	111	123	132	138
Miscellaneous Products	6	-	-	-
Sulfur (tons/d)	-	5	-	-
Total (6)	1,987	1,945	2,098	2,216

(1) Projected volumes based on estimated growth in demand for refined products in California.

(2) Projected volumes based on estimated growth in demand for gasoline in Maricopa County of 14% and 22% for 2002 and 2005, respectively.

(3) Projected volumes calculated assuming growth in demand for gasoline is similar to that for Arizona.

(4) Includes a small volume of naphtha jet fuel and kerosene (< 300 bbl/d combined).

(5) Calibration volume is the sum of various "produced" residual oil blendstocks -- coker bottoms, solvent deasphalting tar, kerosene, and light cycle oil.

(6) Excludes sulfur.

Sources: Surveys -- PIIRA Data & 1998 California Refinery Survey; and

Calibration -- ARMS Calibration results.

Reference -- Derived using growth rates estimated by CEC.

Exhibit 3: In-Place Process Unit Capacity
(K bbl/d)

Type of Process	Process	Calibration	Reference	
			2002	2005
Crude Distillation	Atmospheric	1,845	1,939	2,025
	Vacuum	-	0	-
Conversion	Coking	488	513	528
	Delayed	390	410	422
	Fluid & Flexi	98	103	106
	Fluid Cat Cracking	655	688	732
	Hydrocracking	393	413	434
	Distillate	263	276	291
	Gas Oil	130	137	143
Upgrading	Alkylation	159	167	172
	Dimersol	5	5	5
	Pen/Hex Isomerization	80	84	86
	Polymerization	6	6	6
	Reforming	418	418	418
Oxygenate Prod.	MTBE	12	12	12
	TAME	5	5	5
Hydrotreating	Naphtha Feed	410	410	410
	Straight Run	150		
	Reformer Feed	260		
	Kerosene & Distillate	398	418	431
	Distillate Dearomatization	125	open	open
	FCC Feed/Heavy Gas Oil	655	688	732
	Conventional	open	open	open
	Deep	open	open	open
	FCC Gasoline	101	101	101
	Benzene Saturation	61	64	66
Hydrogen (MM scf/d)		1,160	1,219	1,256
Other	Aromatics Plant	-	0	0
	Butane Isomerization	18	18	18
	Lube Oil	25	26	27
	Solvent Deasphalting	50	50	50
	Sulfur Recovery (K tons/d)	6	6	6
	Tail Gas Recovery (K tons/d)	0	0	0
Fractionation	Debutanization	open	203	215
	Depentanization	60	60	60
	Naphtha Splitter (Benz. Prec.)	open	108	114
	Naphtha Splitter (T90 Ctrl.)	open	0	0
	Alkylate Splitter	open	0	0
	Heavy Reformate Splitter	open	0	0
	FCC Naphtha Splitter	open	152	161
	FCC Naphtha T90 Control	open	161	171

Sources: Calibration: Exhibit 1.2; Reference: Derived

Exhibit 4: Regulatory Scenarios and Modeling Assumptions

Case Number -->	Intermediate Term													
	Averaging Mode													
	MTBE		No Oxy	Ethanol								TBA	ETBE	Mixed Oxy
	1	2	1	1a	1b	1c	2	3	4	5	6	1	1	1
SCENARIO DEFINITION														
Period														
Intermediate term	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Long term														
Oxygenate														
MTBE	X	X												
Ethanol			X	X	X	X	X	X	X	X	X			
TBA												X		
ETBE													X	
Mixed														X
MTBE Ban Region														
California			X	X	X	X	X	X				X	X	X
United States										X	X	X		
Other Policies														
Business as Usual	X			X	X	X			X			X	X	X
H.R. 630 passed		X	X					X			X			
1 psi RVP Ethanol Waiver								X			X			
MODELING ASSUMPTIONS														
Process Capacity Addition														
Only Debottlenecking	X	X	X	X	X	X	X	X	X	X	X	X	X	X
New Capacity Allowed														
Predictive Model														
Averaging Mode	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Flat Limit Mode														
CARB Flat Limits Recipe														
California RFG														
RVP = 6.8 psi	X	X	X									X	X	X
RVP = 5.5 psi + 1.3 psi (1)				X	X	X	X		X	X				
RVP = 6.5 psi + 1.3 psi (2)								X			X			
Arizona RFG														
MTBE blending	X	X	X	X	X	X	X	X				X	X	X
TAME blending	X	X	X	X	X	X	X	X				X	X	X
Ethanol blending										X	X	X		
TBA blending												X		X
ETBE blending													X	X
RVP = 6.6 to 6.8 psi	X	X	X	X	X	X	X	X				X	X	X
RVP = 5.5 psi + 1.3 psi (1)									X	X				
RVP = 6.5 psi + 1.3 psi (2)											X			
Conventional Gasoline														
MTBE blending	X	X	X	X	X	X	X	X				X	X	X
TAME blending	X	X	X	X	X	X	X	X	X	X	X	X	X	X
TBA blending												X		X
ETBE blending													X	X
Maximum Alkylate Imports (3)														
100 K bbl/d			X	X				X	X			X	X	X
175 K bbl/d					X									
50 K bbl/d						X								
75 K bbl/d									X	X	X			
Zero														
FCC Feed Hydrotreating														
Conventional	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Deep	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Note: Oxygenate, CARBOB, and Alkylate supply curves set to match specifications for each case.

(1) The RVP of finished, ethanol-blended gasoline is 1.3 psi higher than the RVP specified in ARMS to account for ethanol's RVP effect on a 5.5 psi RVP base blend.

(2) The RVP of finished, ethanol-blended gasoline is 1.3 psi higher than the RVP specified in ARMS to account for ethanol's RVP effect on a 6.5 psi RVP base blend.

(3) In addition to imports in the Reference cases.

Exhibit 4: Regulatory Scenarios and Modeling Assumptions

Case Number -->	Intermediate Term													
	Flat Limit Mode													
	MTBE				No Oxy	Ethanol						TBA	ETBE	Mixed Oxy
	1	1c	1d	2		1	1	2	3	3c	3d			
SCENARIO DEFINITION														
Period														
Intermediate term	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Long term														
Oxygenate														
MTBE	x	x	x	x										
Ethanol						x	x	x	x	x	x			
TBA												x		
ETBE												x		
Mixed												x		
MTBE Ban Region														
California						x	x	x	x	x	x	x	x	x
United States														
Other Policies														
Business as Usual	x	x	x			x						x	x	x
H.R. 630 passed					x	x		x						
1 psi RVP Ethanol Waiver								x	x	x				
MODELING ASSUMPTIONS														
Process Capacity Addition														
Only Debottlenecking					x	x	x	x	x	x	x	x	x	x
New Capacity Allowed														
Predictive Model														
Averaging Mode														
Flat Limit Mode	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CARB Flat Limits Recipe														
California RFG														
RVP = 6.8 psi	x	x	x	x	x							x	x	x
RVP = 5.5 psi + 1.3 psi (1)						x	x							
RVP = 6.5 psi + 1.3 psi (2)								x	x	x				
Arizona RFG														
MTBE blending	x	x	x	x	x	x	x	x	x	x	x	x	x	x
TAME blending	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Ethanol blending														
TBA blending												x		x
ETBE blending												x	x	x
RVP = 6.6 to 6.8 psi	x	x	x	x	x	x	x	x	x	x	x	x	x	x
RVP = 5.5 psi + 1.3 psi (1)														
RVP = 6.5 psi + 1.3 psi (2)														
Conventional Gasoline														
MTBE blending	x	x	x	x	x	x	x	x	x	x	x	x	x	x
TAME blending	x	x	x	x	x	x	x	x	x	x	x	x	x	x
TBA blending											x		x	
ETBE blending											x	x		
Maximum Alkylate Imports (3)														
100 K bbl/d					x	x	x	x	x	x	x	x	x	x
175 K bbl/d														
50 K bbl/d														
75 K bbl/d														
Zero														
FCC Feed Hydrotreating														
Conventional	x	x			x	x	x	x	x	x	x	x	x	x
Deep	x		x	x	x	x	x	x	x	x	x	x	x	x

Note: Oxygenate, CARBOB, and Alkylate supply curves set to match specifications for each case.

(1) The RVP of finished, ethanol-blended gasoline is 1.3 psi higher than the RVP specified in ARMS to account for ethanol's RVP effect on a 5.5 psi RVP base blend.

(2) The RVP of finished, ethanol-blended gasoline is 1.3 psi higher than the RVP specified in ARMS to account for ethanol's RVP effect on a 6.5 psi RVP base blend.

(3) In addition to imports in the Reference cases.

Exhibit 4: Regulatory Scenarios and Modeling Assumptions

Case Number -->	Long Term													
	Averaging Mode													
	MTBE		No Oxy	Ethanol								TBA	ETBE	Mixed Oxy
	1	2	1	1a	1b	1c	2	3	4	5	6	1	1	1
SCENARIO DEFINITION														
Period														
Intermediate term														
Long term	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Oxygenate														
MTBE	X	X												
Ethanol				X	X	X	X	X	X	X	X			
TBA												X		
ETBE													X	
Mixed														X
MTBE Ban Region														
California			X	X	X	X	X	X				X	X	X
United States										X	X	X		
Other Policies														
Business as Usual	X			X	X	X			X			X	X	X
H.R. 630 passed		X	X					X			X			
1 psi RVP Ethanol Waiver								X			X			
MODELING ASSUMPTIONS														
Process Capacity Addition														
Only Debottlenecking														
New Capacity Allowed	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Predictive Model														
Averaging Mode	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Flat Limit Mode														
CARB Flat Limits Recipe														
California RFG														
RVP = 6.8 psi	X	X	X									X	X	X
RVP = 5.5 psi + 1.3 psi (1)				X	X	X	X			X	X			
RVP = 6.5 psi + 1.3 psi (2)								X			X			
Arizona RFG														
MTBE blending	X	X	X	X	X	X	X	X				X	X	X
TAME blending	X	X	X	X	X	X	X	X				X	X	X
Ethanol blending										X	X	X		
TBA blending												X		X
ETBE blending													X	X
RVP = 6.6 to 6.8 psi	X	X	X	X	X	X	X	X				X	X	X
RVP = 5.5 psi + 1.3 psi (1)									X	X				
RVP = 6.5 psi + 1.3 psi (2)											X			
Conventional Gasoline														
MTBE blending	X	X	X	X	X	X	X	X				X	X	X
TAME blending	X	X	X	X	X	X	X	X	X	X	X	X	X	X
TBA blending												X		X
ETBE blending													X	X
Maximum Alkylate Imports (3)														
100 K bbl/d			X	X				X	X			X	X	X
175 K bbl/d					X									
50 K bbl/d						X								
75 K bbl/d									X	X	X			
Zero														
FCC Feed Hydrotreating														
Conventional	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Deep	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Note: Oxygenate, CARBOB, and Alkylate supply curves set to match specifications for each case.

(1) The RVP of finished, ethanol-blended gasoline is 1.3 psi higher than the RVP specified in ARMS to account for ethanol's RVP effect on a 5.5 psi RVP base blend.

(2) The RVP of finished, ethanol-blended gasoline is 1 psi higher than the RVP specified in ARMS to account for ethanol's RVP effect on a 6.5 psi RVP base blend.

(3) In addition to imports in the Reference cases.

Exhibit 4: Regulatory Scenarios and Modeling Assumptions

Case Number -->	Long Term													
	Flat Limit Mode													
	MTBE				No Oxy	Ethanol						TBA	ETBE	Mixed Oxy
	1	1c	1d	2		1	1	2	3	3c	3d			
SCENARIO DEFINITION														
Period														
Intermediate term														
Long term	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Oxygenate														
MTBE	x	x	x	x										
Ethanol						x	x	x	x	x	x			
TBA												x		
ETBE												x		
Mixed												x		
MTBE Ban Region														
California						x	x	x	x	x	x	x	x	x
United States														
Other Policies														
Business as Usual	x	x	x			x						x	x	x
H.R. 630 passed					x	x		x						
1 psi RVP Ethanol Waiver								x	x	x				
MODELING ASSUMPTIONS														
Process Capacity Addition														
Only Debottlenecking														
New Capacity Allowed					x	x	x	x	x	x	x	x	x	x
Predictive Model														
Averaging Mode														
Flat Limit Mode	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CARB Flat Limits Recipe														
California RFG														
RVP = 6.8 psi	x	x	x	x	x							x	x	x
RVP = 5.5 psi + 1.3 psi (1)						x	x							
RVP = 6.5 psi + 1.3 psi (2)								x	x	x				
Arizona RFG														
MTBE blending	x	x	x	x	x	x	x	x	x	x	x	x	x	x
TAME blending	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Ethanol blending														
TBA blending												x		x
ETBE blending												x		x
RVP = 6.6 to 6.8 psi	x	x	x	x	x	x	x	x	x	x	x	x	x	x
RVP = 5.5 psi + 1.3 psi (1)														
RVP = 6.5 psi + 1.3 psi (2)														
Conventional Gasoline														
MTBE blending	x	x	x	x	x	x	x	x	x	x	x	x	x	x
TAME blending	x	x	x	x	x	x	x	x	x	x	x	x	x	x
TBA blending											x		x	
ETBE blending											x		x	
Maximum Alkylate Imports (3)														
100 K bbl/d					x	x	x	x	x	x	x	x	x	x
175 K bbl/d														
50 K bbl/d														
75 K bbl/d														
Zero														
FCC Feed Hydrotreating														
Conventional	x	x			x	x	x	x	x	x	x	x	x	x
Deep	x		x	x	x	x	x	x	x	x	x	x	x	x

Note: Oxygenate, CARBOB, and Alkylate supply curves set to match specifications for each case.

(1) The RVP of finished, ethanol-blended gasoline is 1.3 psi higher than the RVP specified in ARMS to account for ethanol's RVP effect on a 5.5 psi RVP base blend.

(2) The RVP of finished, ethanol-blended gasoline is 1.3 psi higher than the RVP specified in ARMS to account for ethanol's RVP effect on a 6.5 psi RVP base blend.

(3) In addition to imports in the Reference cases.

Exhibit 4: Regulatory Scenarios and Modeling Assumptions
Supplement

Case Number -->	Intermediate Term			Long Term					
	Mode			Mode					
	Recipe Ethanol	Averaging No Oxy	Flat No Oxy	Recipe Ethanol	Averaging		Flat		
	7	2	2	7	8	2	3	4	8
SCENARIO DEFINITION									
Period									
Intermediate term	x	x	x						
Long term				x	x	x	x	x	x
Oxygenate									
MTBE									
Ethanol	x			x	x		x	x	
TBA									
ETBE									
Mixed									
MTBE Ban Region									
California	x			x	x	x	x	x	x
United States		x	x		x		x	x	
Other Policies									
Business as Usual					x		x	x	
H.R. 630 passed		x	x			x	x		x
1 psi RVP Ethanol Waiver	x			x					
MODELING ASSUMPTIONS									
Process Capacity Addition									
Only Debottlenecking	x	x	x						
New Capacity Allowed				x	x	x	x	x	x
Predictive Model									
Averaging Mode		x			x	x	x		
Flat Limit Mode			x				x	x	x
CARB Flat Limits Recipe	x			x					
California RFG									
RVP = 6.8 psi		x	x			x	x		x
RVP = 5.5 psi + 1.3 psi (1)					x			x	x
RVP = 6.5 psi + 1.3 psi (2)	x			x					
Arizona RFG									
MTBE blending	x			x	x	x	x	x	x
TAME blending	x			x	x	x	x	x	x
Ethanol blending		x	x		x		x		x
TBA blending									
ETBE blending									
RVP = 6.6 to 6.8 psi	x			x	x	x	x	x	x
RVP = 5.5 psi + 1.3 psi (1)		x	x		x		x	x	
RVP = 6.5 psi + 1.3 psi (2)									
Conventional Gasoline									
MTBE blending	x			x	x	x	x	x	x
TAME blending	x			x	x	x	x	x	x
TBA blending									
ETBE blending									
Maximum Alkylate Imports (3)									
100 K bbl/d	x			x					
175 K bbl/d									
50 K bbl/d									
75 K bbl/d	x	x			x		x	x	
Zero					x	x		x	x
FCC Feed Hydrotreating									
Conventional	x	x	x	x	x	x	x	x	x
Deep	x	x	x	x	x	x	x	x	x

Note: Oxygenate, CARBOB, and Alkylate supply curves set to match specifications for each case.

(1) The RVP of finished, ethanol-blended gasoline is 1.3 psi higher than the RVP specified in ARMS to account for ethanol's RVP effect on a 5.5 psi RVP base blend.

(2) The RVP of finished, ethanol-blended gasoline is 1.3 psi higher than the RVP specified in ARMS to account for ethanol's RVP effect on a 6.5 psi RVP base blend.

(3) In addition to imports in the Reference cases.

Exhibit 5: Modeling Results --
**Process Unit Utilization, Additions, and Operations, by Case
(K bbl/d)**

Type of Process	Process	Intermediate Term							
		Averaging Mode							
		MTBE		No Oxy	Ethanol				
		Ref			BasU	BasU	BasU	HR630	RVPw
	Case Number -->	2002	HR 630	HR630	Alk-100	Alk-175	Alk-50		
		1	2	1	1a	1b	1c	2	3
USE OF EXISTING CAPACITY									
Crude Distillation	Atmospheric	1,876	1,880	1,756	1,739	1,760	1,699	see 1a	infeas
Conversion	Fluid Cat Cracker	678	680	665	676	644	667		
	Hydrocracker - Distillate Feed	266	273	240	211	247	200		
	Hydrocracker - Gas Oil Feed	137	137	126	111	130	105		
	Coking - Delayed	356	357	324	319	325	308		
	Coking - Fluid & Flexi	103	103	103	103	103	103		
Upgrading	Alkylation	159	163	167	167	165	167		
	Dimersol	1							
	Pen/Hex Isomerization	64	84	84	63	56	52		
	Polymerization	6	5	6	6	5	6		
	Reforming (150-350 psi)	310	321	208	232	251	214		
Oxygenate Prod.	MTBE Plant	12	12	12	12	12	12		
	Tame Plant	2	2	2	2	2	2		
Hydrotreating	Naphtha & Isom Feed Desulf.	70	70	71	115	122	91		
	Reformer Feed Desulfurization	267	270	179	170	175	143		
	Distillate Desulfurization	334	329	306	345	322	347		
	Distillate Dearomatization	108	110	109	115	111	115		
	FCC Feed Desulf. -- Conv.	324	325	305	309	304	304		
	FCC Feed Desulf. -- Deep	351	352	330	335	329	329		
	FCC Naphtha Hydrotreater	73	71	96	83	64	90		
Hydrogen (foeb)	Benzene Saturation	60	64	52	38	42	47		
	Hydrogen Plant (foeb)	59	59	59	55	57	54		
Other	Butane Isomerization	18	18	18	18	18	18		
	Lubes & Waxes	24	24	24	24	24	24		
	Solvent Deasphalting	50	50	50	50	50	50		
	Sulfur Recovery (K tons/d)	6	6	5	5	5	5		
Fractionation	Debutanization	193	198	190	191	188	188		
	Depentanization	60	60	60	60	60	60		
	Lt. Naphtha Spl. (Benz. Prec.)	103	108	108	108	108	108		
	FCC Naphtha Splitter	144	141	152	152	150	152		
	FCC Naphtha T90 Control	153	161	161	161	161	161		
NEW CAPACITY									
Upgrading	Alkylation					2		1	
	Pen/Hex Isomerization								
	Polymerization								
Hydrotreating	FCC Naphtha Hydrotreater								
	Benzene Saturation								
Hydrogen (foeb)	Hydrogen Plant (foeb)								
Other	Butane Isomerization								
	Propane Dehydrogenation								
	FCC Gas Processing								
	Sulfur Recovery (K tons/d)								
Fractionation	Debutanization								
	Depentanization								
	Lt. Naphtha Spl. (Benz. Prec.)				5	5	5	5	
	Naphtha Splitter (T90 Control)								
	Heavy Reformate Splitter								
	FCC Naphtha Splitter					8		8	
	FCC Naphtha (T90 Control)			8	8	8	8	8	
OPERATIONS									
Operating Indices	FCC Conversion (Vol %)	73.7	73.7	77.1	78.5	74.8	79.7		
	Reformer Severity (RON)	99.9	100.0	100.0	100.0	100.0	100.0		
Charge Rates	Fluid Cat Cracker	678	680	639	647	637	636		
	Reformer (150-350 psi)	310	321	208	232	251	214		
FCC Olefin Max Cat. (%)									

Exhibit 5: Modeling Results --
**Process Unit Utilization, Additions, and Operations, by Case
(K bbl/d)**

Type of Process	Process	Intermediate Term					
		Averaging Mode					
		Ethanol			TBA	ETBE	Mixed Oxy
		BasU	HR630	RVPw	BasU	BasU	BasU
USban	USban	USban	USban	USban	BasU	BasU	BasU
Case Number -->	4	5	6	1	1	1	1
USE OF EXISTING CAPACITY							
Crude Distillation	Atmospheric	1,655	see 4	infeas	1,858	1,827	1,868
Conversion	Fluid Cat Cracker	649			673	657	675
	Hydrocracker - Distillate Feed	196			256	263	261
	Hydrocracker - Gas Oil Feed	103			134	137	137
	Coking - Delayed	296			351	344	354
	Coking - Fluid & Flexi	103			103	103	103
Upgrading	Alkylation	167			167	148	158
	Dimersol						1
	Pen/Hex Isomerization	50			84	57	63
	Polymerization	6			5	5	5
	Reforming (150-350 psi)	211			347	273	317
Oxygenate Prod.	MTBE Plant				12	12	12
	Tame Plant	2			2	2	2
Hydrotreating	Naphtha & Isom Feed Desulf.	100			72	90	69
	Reformer Feed Desulfurization	136			279	236	267
	Distillate Desulfurization	335			339	335	337
	Distillate Dearomatization	114			113	113	107
	FCC Feed Desulf. -- Conv.	296			321	314	322
	FCC Feed Desulf. -- Deep	320			348	340	349
	FCC Naphtha Hydrotreater	92			101	46	67
Hydrogen (foeb)	Benzene Saturation	47			64	45	64
	Hydrogen Plant (foeb)	53			58	59	58
Other	Butane Isomerization	18			18	18	18
	Lubes & Waxes	24			24	24	24
	Solvent Deasphalting	50			50	50	50
	Sulfur Recovery (K tons/d)	5			6	5	6
Fractionation	Debutanization	183			196	166	189
	Depentanization	60			60	60	60
	Lt. Naphtha Spl. (Benz. Prec.)	108			108	77	102
	FCC Naphtha Splitter	152			126	126	141
	FCC Naphtha T90 Control	161			161	90	161
NEW CAPACITY							
Upgrading	Alkylation	8					
	Pen/Hex Isomerization						
	Polymerization						
Hydrotreating	FCC Naphtha Hydrotreater						
	Benzene Saturation				3		
Hydrogen (foeb)	Hydrogen Plant (foeb)						
	Butane Isomerization						
	Propane Dehydrogenation						
	FCC Gas Processing						
	Sulfur Recovery (K tons/d)						
Fractionation	Debutanization						
	Depentanization						
	Lt. Naphtha Spl. (Benz. Prec.)	5			5		
	Naphtha Splitter (T90 Control)						
	Heavy Reformate Splitter						
	FCC Naphtha Splitter	8					
	FCC Naphtha (T90 Control)	8			8		
OPERATIONS							
Operating Indices	FCC Conversion (Vol %)	79.4			73.7	69.4	73.7
	Reformer Severity (RON)	100.0			100.0	99.9	100.0
Charge Rates	Fluid Cat Cracker	619			673	657	675
	Reformer (150-350 psi)	211			347	274	317
FCC Olefin Max Cat. (%)							

Exhibit 5: Modeling Results --
**Process Unit Utilization, Additions, and Operations, by Case
(K bbl/d)**

Type of Process	Process Case Number -->	Intermediate Term						
		Flat Limit Mode					No Oxy	Ethanol
		MTBE			HR 630	HR 630		
		Ref	Conv FCC	Deep FCC		BasU	Alk-100	
2002	Feed Hydro	Feed Hydro						
1	1c	1d			2	1	1	2
USE OF EXISTING CAPACITY								
Crude Distillation	Atmospheric	1,873	1,869	1,889	1,900	1,807	1,798	see 1
Conversion	Fluid Cat Cracker	677	673	688	688	688	688	
	Hydrocracker - Distillate Feed	261	276	276	276	243	240	
	Hydrocracker - Gas Oil Feed	137	137	137	137	127	126	
	Coking - Delayed	356	358	365	362	337	334	
	Coking - Fluid & Flexi	103	103	103	103	103	103	
Upgrading	Alkylation	154	153	141	166	167	167	
	Dimersol							
	Pen/Hex Isomerization	63	64	65	84	84	55	
	Polymerization	6	5	5	5	6	6	
	Reforming (150-350 psi)	311	348	324	346	246	272	
Oxygenate Prod.	MTBE Plant	12	12	12	12	12	12	
	Tame Plant	2	2	2	2	2	2	
Hydrotreating	Naphtha & Isom Feed Desulf.	70	70	68	71	73	121	
	Reformer Feed Desulfurization	266	297	270	280	185	200	
	Distillate Desulfurization	337	338	341	351	308	297	
	Distillate Dearomatization	108	106	119	102	108	107	
	FCC Feed Desulf. -- Conv.	323	673		328	315	314	
	FCC Feed Desulf. -- Deep	350		681	356	341	340	
	FCC Naphtha Hydrotreater	71	210		71	84	82	
	Benzene Saturation	45	48	32	64	64	46	
Hydrogen (foeb)	Hydrogen Plant (foeb)	58	60	60	59	58	56	
Other	Butane Isomerization	18	18	13	18	18	18	
	Lubes & Waxes	24	24	24	24	24	24	
	Solvent Deasphalting	50	50	50	50	50	50	
	Sulfur Recovery (K tons/d)	6	6	6	6	5	5	
Fractionation	Debutanization	185	185	175	203	199	202	
	Depentanization	60	60	60	60	60	60	
	Lt. Naphtha Spl. (Benz. Prec.)	103	102	107	108	108	108	
	FCC Naphtha Splitter	131	311		135	152	152	
	FCC Naphtha T90 Control	48		81	161	161	161	
NEW CAPACITY								
Upgrading	Alkylation						8	
	Pen/Hex Isomerization							
	Polymerization							
Hydrotreating	FCC Naphtha Hydrotreater							
	Benzene Saturation						0	
Hydrogen (foeb)	Hydrogen Plant (foeb)							
Other	Butane Isomerization							
	Propane Dehydrogenation							
	FCC Gas Processing							
	Sulfur Recovery (K tons/d)							
Fractionation	Debutanization							
	Depentanization							
	Lt. Naphtha Spl. (Benz. Prec.)						5	5
	Naphtha Splitter (T90 Control)							
	Heavy Reformate Splitter							
	FCC Naphtha Splitter						8	
	FCC Naphtha (T90 Control)						8	8
OPERATIONS								
Operating Indices	FCC Conversion (Vol %)	71.3	67.5	65.0	74.0	78.3	79.2	
	Reformer Severity (RON)	99.9	99.9	99.7	100.0	100.0	100.0	
Charge Rates	Fluid Cat Cracker	677	673	688	688	659	657	
	Reformer (150-350 psi)	311	349	324	346	246	272	
FCC Olefin Max Cat. (%)								

Exhibit 5: Modeling Results --
**Process Unit Utilization, Additions, and Operations, by Case
(K bbl/d)**

Type of Process	Process	Intermediate Term					
		Flat Limit Mode					
		Ethanol			TBA	ETBE	Mixed Oxy
		RVPw	Conv Hyd	Deep Hyd	BasU	BasU	BasU
Case Number -->		3	3c	3d	1	1	1
USE OF EXISTING CAPACITY							
Crude Distillation	Atmospheric	1,796	1,892	1,522	1,900	1,822	1,891
Conversion	Fluid Cat Cracker	625	656	488	688	656	684
	Hydrocracker - Distillate Feed	276	276	276	261	264	261
	Hydrocracker - Gas Oil Feed	137	137	137	137	137	137
	Coking - Delayed	355	397	317	362	344	360
	Coking - Fluid & Flexi	103	103	103	103	103	103
Upgrading	Alkylation	153	160	118	167	144	160
	Dimersol						2
	Pen/Hex Isomerization	84	84	80	84	57	84
	Polymerization	5	5	5	5	5	5
	Reforming (150-350 psi)	320	352	291	356	275	346
Oxygenate Prod.	MTBE Plant	1	12	0	12	12	12
	Tame Plant	2	0	0	2	2	2
Hydrotreating	Naphtha & Isom Feed Desulf.	74	79	67	71	88	71
	Reformer Feed Desulfurization	296	312	269	300	237	294
	Distillate Desulfurization	344	354	251	338	334	343
	Distillate Dearomatization	144	118	115	103	118	104
	FCC Feed Desulf. -- Conv.	298	656		328	313	327
	FCC Feed Desulf. -- Deep	323		483	356	339	354
	FCC Naphtha Hydrotreater	101	210		83	41	86
Hydrogen (foeb)	Benzene Saturation	27	25	19	64	26	64
	Hydrogen Plant (foeb)	62	62	55	58	59	58
Other	Butane Isomerization	18	18	18	18	17	18
	Lubes & Waxes	24	24	24	24	24	24
	Solvent Deasphalting	50	50	50	50	50	50
	Sulfur Recovery (K tons/d)	5	6	4	6	5	6
Fractionation	Debutanization	174	180	146	203	159	197
	Depentanization	60	60	60	60	60	60
	Lt. Naphtha Spl. (Benz. Prec.)	98	104	108	108	79	104
	FCC Naphtha Splitter	151	326		136	93	142
	FCC Naphtha T90 Control	161		88	161		104
NEW CAPACITY							
Upgrading	Alkylation						
	Pen/Hex Isomerization						
	Polymerization						
Hydrotreating	FCC Naphtha Hydrotreater	5	10				
	Benzene Saturation						
Hydrogen (foeb)	Hydrogen Plant (foeb)						
	Butane Isomerization						
	Propane Dehydrogenation						
	FCC Gas Processing						
Fractionation	Sulfur Recovery (K tons/d)						
	Debutanization						
	Depentanization						
	Lt. Naphtha Spl. (Benz. Prec.)						
	Naphtha Splitter (T90 Control)						
	Heavy Reformate Splitter						
	FCC Naphtha Splitter						
OPERATIONS	FCC Naphtha (T90 Control)	8		5	6		
	FCC Conversion (Vol %)	67.2	67.4	65.0	74.5	66.7	73.7
Operating Indices	Reformer Severity (RON)	100.0	99.9	100.0	100.0	99.9	100.0
	Fluid Cat Cracker	625	656	488	688	656	684
	Reformer (150-350 psi)	320	352	291	356	275	346
FCC Olefin Max Cat. (%)							

Exhibit 5: Modeling Results --
**Process Unit Utilization, Additions, and Operations, by Case
(K bbl/d)**

Type of Process	Process	Long Term							
		Averaging Mode							
		MTBE		No Oxy	Ethanol				
		Ref	2005	HR 630	HR630	BasU	BasU	BasU	RVPw
Case Number -->	1	2	1	1a	1b	1c	2	3	
USE OF EXISTING CAPACITY									
Crude Distillation	Atmospheric	1,986	1,994	1,908	1,957	1,921	1,987	see 1a	infeas
Conversion	Fluid Cat Cracker	718	722	686	706	694	718		
	Hydrocracker - Distillate Feed	285	291	284	284	278	284		
	Hydrocracker - Gas Oil Feed	143	143	143	143	140	143		
	Coking - Delayed	383	384	361	374	365	381		
	Coking - Fluid & Flexi	106	106	106	106	106	106		
Upgrading	Alkylation	167	172	172	172	172	172		
	Dimersol	2	0						
	Pen/Hex Isomerization	67	86	86	53	47	60		
	Polymerization	6	6	6	6	6	6		
	Reforming (150-350 psi)	330	347	374	324	311	337		
Oxygenate Prod.	MTBE Plant	12	12	12	12	12	12		
	Tame Plant	2	2	2	2	2	2		
Hydrotreating	Naphtha & Isom Feed Desulf.	74	75	78	111	109	88		
	Reformer Feed Desulfurization	283	293	294	223	219	255		
	Distillate Desulfurization	351	355	361	350	351	355		
	Distillate Dearomatization	116	117	109	120	123	110		
	FCC Feed Desulf. -- Conv.	343	344	327	337	331	343		
	FCC Feed Desulf. -- Deep	372	373	355	365	359	372		
	FCC Naphtha Hydrotreater	79	74	72	101	100	101		
Hydrogen (foeb)	Benzene Saturation	64	66	52	66	66	59		
	Hydrogen Plant (foeb)	63	63	59	63	63	63		
Other	Butane Isomerization	18	18	18	18	18	18		
	Lubes & Waxes	25	25	25	25	25	25		
	Solvent Deasphalting	50	50	50	50	50	50		
	Sulfur Recovery (K tons/d)	6	6	6	6	6	6		
Fractionation	Debutanization	205	210	215	211	203	215		
	Depentanization	60	60	60	60	60	60		
	Lt. Naphtha Spl. (Benz. Prec.)	109	114	114	114	114	114		
	FCC Naphtha Splitter	153	154	150	153	156	161		
	FCC Naphtha T90 Control	164	171	171	171	171	171		
NEW CAPACITY									
Upgrading	Alkylation			43			25		
	Pen/Hex Isomerization								
	Polymerization			38		2	10		
Hydrotreating	FCC Naphtha Hydrotreater								
	Benzene Saturation								
Hydrogen (foeb)	Hydrogen Plant (foeb)								
	Butane Isomerization			23			15		
Other	Propane Dehydrogenation								
	FCC Gas Processing			621	100	55	213		
	Sulfur Recovery (K tons/d)								
Fractionation	Debutanization						6		
	Depentanization				63	61	63		
	Lt. Naphtha Spl. (Benz. Prec.)			86	34		62		
	Naphtha Splitter (T90 Control)			82		14			
	Heavy Reformate Splitter			11					
	FCC Naphtha Splitter								
	FCC Naphtha (T90 Control)		44	44	48	53	60		
OPERATIONS									
Operating Indices	FCC Conversion (Vol %)	73.7	73.7	74.0	73.5	72.5	75.0		77.8
	Reformer Severity (RON)	99.9	100.0	99.8	100.0	100.0	100.0		94.7
Charge Rates	Fluid Cat Cracker	718	722	686	706	694	718		712
	Reformer (150-350 psi)	331	347	374	324	311	337		288
FCC Olefin Max Cat. (%)				81.5	12.8	7.1	26.7		100.0

Exhibit 5: Modeling Results --
**Process Unit Utilization, Additions, and Operations, by Case
(K bbl/d)**

Type of Process	Process	Long Term						
		Averaging Mode						Mixed Oxy
		Ethanol			TBA		ETBE	
		BasU	HR630	RVPw	BasU	BasU	BasU	
USban	USban	USban	USban	BasU	BasU	BasU	BasU	
Case Number -->		4	5	6	1	1	1	
USE OF EXISTING CAPACITY								
Crude Distillation	Atmospheric	2,018	see 4	infeas	1,976	1,937	1,955	
Conversion	Fluid Cat Cracker	732			714	698	706	
	Hydrocracker - Distillate Feed	288			284	284	284	
	Hydrocracker - Gas Oil Feed	143			143	143	143	
	Coking - Delayed	391			379	371	375	
	Coking - Fluid & Flexi	106			106	106	106	
Upgrading	Alkylation	172			172	156	161	
	Dimersol						0	
	Pen/Hex Isomerization	58			86	61	66	
	Polymerization	6			6	5	6	
	Reforming (150-350 psi)	360			368	293	314	
Oxygenate Prod.	MTBE Plant	0			12	12	12	
	Tame Plant	2			2	2	2	
Hydrotreating	Naphtha & Isom Feed Desulf.	81			75	94	72	
	Reformer Feed Desulfurization	266			292	253	278	
	Distillate Desulfurization	364			377	350	350	
	Distillate Dearomatization	111			109	122	120	
	FCC Feed Desulf. -- Conv.	349			341	333	337	
	FCC Feed Desulf. -- Deep	379			369	361	365	
	FCC Naphtha Hydrotreater	101			85	50	60	
Hydrogen (foeb)	Benzene Saturation	66			66	48	48	
	Hydrogen Plant (foeb)	64			61	63	62	
Other	Butane Isomerization	18			18	18	18	
	Lubes & Waxes	25			25	25	25	
	Solvent Deasphalting	50			50	50	50	
	Sulfur Recovery (K tons/d)	6			6	6	6	
Fractionation	Debutanization	215			212	177	189	
	Depentanization	60			60	60	60	
	Lt. Naphtha Spl. (Benz. Prec.)	114			114	84	107	
	FCC Naphtha Splitter	150			149	133	144	
	FCC Naphtha T90 Control	171			171	94	134	
NEW CAPACITY								
Upgrading	Alkylation	25						
	Pen/Hex Isomerization							
	Polymerization	8			0			
Hydrotreating	FCC Naphtha Hydrotreater							
	Benzene Saturation							
Hydrogen (foeb)	Hydrogen Plant (foeb)							
	Butane Isomerization	17						
Other	Propane Dehydrogenation							
	FCC Gas Processing	319						
	Sulfur Recovery (K tons/d)	0						
Fractionation	Debutanization	11						
	Depentanization	69						
	Lt. Naphtha Spl. (Benz. Prec.)	74			63			
	Naphtha Splitter (T90 Control)							
	Heavy Reformate Splitter							
	FCC Naphtha Splitter							
OPERATIONS	FCC Naphtha (T90 Control)	46			43			
Operating Indices	FCC Conversion (Vol %)	74.7		69.5	74.4	69.5	71.5	
	Reformer Severity (RON)	100.0		100.0	100.0	99.9	99.9	
Charge Rates	Fluid Cat Cracker	732		728	714	698	706	
	Reformer (150-350 psi)	360		352	368	293	314	
FCC Olefin Max Cat. (%)		39.3						

Exhibit 5: Modeling Results --
**Process Unit Utilization, Additions, and Operations, by Case
(K bbl/d)**

Type of Process	Process Case Number -->	Long Term						
		Flat Limit Mode						
		MTBE			No Oxy	Ethanol		
		Ref 2005	Conv FCC Feed Hydro	Deep FCC Feed Hydro	HR 630	BasU Alk-100	HR630	
		1	1c	1d	2	1	1	2
USE OF EXISTING CAPACITY								
Crude Distillation	Atmospheric	1,981	2,006	2,011	2,019	1,989	1,982	see 1
Conversion	Fluid Cat Cracker	716	723	732	732	720	717	
	Hydrocracker - Distillate Feed	284	291	289	291	284	284	
	Hydrocracker - Gas Oil Feed	143	143	143	143	143	143	
	Coking - Delayed	383	391	393	390	383	380	
	Coking - Fluid & Flexi	106	106	106	106	106	106	
Upgrading	Alkylation	161	159	152	172	172	172	
	Dimersol	1			2			
	Pen/Hex Isomerization	67	86	69	86	86	51	
	Polymerization	6	5	5	6	6	6	
	Reforming (150-350 psi)	333	372	343	356	395	334	
Oxygenate Prod.	MTBE Plant	12	12	12	12	12	12	
	Tame Plant	2	2	2	2	2	2	
Hydrotreating	Naphtha & Isom Feed Desulf.	74	75	72	76	81	98	
	Reformer Feed Desulfurization	283	305	288	288	284	241	
	Distillate Desulfurization	352	366	364	373	370	353	
	Distillate Dearomatization	117	114	125	108	110	115	
	FCC Feed Desulf. -- Conv.	342	723		349	344	342	
	FCC Feed Desulf. -- Deep	371		725	379	372	371	
	FCC Naphtha Hydrotreater	76	210		77	77	101	
	Benzene Saturation	51	55	33	66	66	66	
Hydrogen (foeb)	Hydrogen Plant (foeb)	62	64	63	63	61	63	
Other	Butane Isomerization	18	18	16	18	18	18	
	Lubes & Waxes	25	25	25	25	25	25	
	Solvent Deasphalting	50	50	50	50	50	50	
	Sulfur Recovery (K tons/d)	6	6	6	6	6	6	
Fractionation	Debutanization	195	193	185	212	215	215	
	Depentanization	60	60	60	60	60	60	
	Lt. Naphtha Spl. (Benz. Prec.)	109	110	113	114	114	114	
	FCC Naphtha Splitter	139	329		156	140	155	
	FCC Naphtha T90 Control	33		113	171	171	171	
NEW CAPACITY								
Upgrading	Alkylation							
	Pen/Hex Isomerization							
	Polymerization					23		
Hydrotreating	FCC Naphtha Hydrotreater							
	Benzene Saturation							
Hydrogen (foeb)	Hydrogen Plant (foeb)							
Other	Butane Isomerization					3		
	Propane Dehydrogenation							
	FCC Gas Processing					375	42	
	Sulfur Recovery (K tons/d)			0	0			
Fractionation	Debutanization					4		
	Depentanization					61		
	Lt. Naphtha Spl. (Benz. Prec.)					95	2	
	Naphtha Splitter (T90 Control)					3		
	Heavy Reformate Splitter							
	FCC Naphtha Splitter							
	FCC Naphtha (T90 Control)					30	51	
OPERATIONS								
Operating Indices	FCC Conversion (Vol %)	70.6	65.0	65.0	73.7	75.0	74.8	
	Reformer Severity (RON)	99.9	99.9	99.7	100.0	100.0	100.0	
Charge Rates	Fluid Cat Cracker	716	723	732	732	720	717	
	Reformer (150-350 psi)	334	372	343	356	395	334	
FCC Olefin Max Cat. (%)						46.9	5.3	

Exhibit 5: Modeling Results --
**Process Unit Utilization, Additions, and Operations, by Case
(K bbl/d)**

Type of Process	Process	Long Term					
		Flat Limit Mode					
		Ethanol			TBA	ETBE	Mixed Oxy
		RVPw	Conv Hyd	Deep Hyd	BasU	BasU	BasU
Case Number -->		3	3c	3d	1	1	1
USE OF EXISTING CAPACITY							
Crude Distillation	Atmospheric	1946	1,947	1,972	2,014	1,932	1,955
Conversion	Fluid Cat Cracker	702	699	716	730	696	706
	Hydrocracker - Distillate Feed	291	291	291	284	284	284
	Hydrocracker - Gas Oil Feed	143	143	143	143	143	143
	Coking - Delayed	374	375	383	389	371	376
	Coking - Fluid & Flexi	106	106	106	106	106	106
Upgrading	Alkylation	172	172	170	172	153	157
	Dimersol				1		
	Pen/Hex Isomerization	86	86	86	86	61	66
	Polymerization	5	5	5	6	5	5
	Reforming (150-350 psi)	335	368	336	382	293	320
Oxygenate Prod.	MTBE Plant	12	12	12	12	12	12
	Tame Plant	2	2	2	2	2	2
Hydrotreating	Naphtha & Isom Feed Desulf.	80	80	81	77	93	72
	Reformer Feed Desulfurization	315	316	318	324	253	278
	Distillate Desulfurization	371	394	374	358	352	350
	Distillate Dearomatization	154	139	130	108	124	121
	FCC Feed Desulf. -- Conv.	335	698		349	332	337
	FCC Feed Desulf. -- Deep	363		709	378	360	365
	FCC Naphtha Hydrotreater	101	210		88	41	58
	Benzene Saturation	26	26	23	66	30	38
Hydrogen (foeb)	Hydrogen Plant (foeb)	65	65	65	61	62	62
Other	Butane Isomerization	18	18	18	18	18	18
	Lubes & Waxes	25	25	25	25	25	25
	Solvent Deasphalting	50	50	50	50	50	50
	Sulfur Recovery (K tons/d)	6	6	6	6	6	6
Fractionation	Debutanization	191	187	183	215	170	182
	Depentanization	60	60	60	60	60	60
	Lt. Naphtha Spl. (Benz. Prec.)	107	110	108	114	84	107
	FCC Naphtha Splitter	159	286		142	108	137
	FCC Naphtha T90 Control	171		113	171		22
NEW CAPACITY							
Upgrading	Alkylation						
	Pen/Hex Isomerization						
	Polymerization						
Hydrotreating	FCC Naphtha Hydrotreater	32	40	107			
	Benzene Saturation						
Hydrogen (foeb)	Hydrogen Plant (foeb)	2					
Other	Butane Isomerization						
	Propane Dehydrogenation						
	FCC Gas Processing	11					
	Sulfur Recovery (K tons/d)				0		
Fractionation	Debutanization						
	Depentanization	109	269	179			
	Lt. Naphtha Spl. (Benz. Prec.)						
	Naphtha Splitter (T90 Control)						
	Heavy Reformate Splitter						
	FCC Naphtha Splitter			114			
	FCC Naphtha (T90 Control)	48	33	40	22		
OPERATIONS							
Operating Indices	FCC Conversion (Vol %)	67.6	65.4	65.0	73.8	66.8	68.9
	Reformer Severity (RON)	100.0	99.9	99.8	100.0	99.9	99.9
Charge Rates	Fluid Cat Cracker	702	699	716	730	696	706
	Reformer (150-350 psi)	335	368	337	382	293	320
FCC Olefin Max Cat. (%)		1.4					

Exhibit 5: Modeling Results --
**Process Unit Utilization, Additions, and Operations, by Case
(K bbl/d)
Supplement**

Type of Process	Process	Intermediate Term			Long Term		
		Mode			Mode		
		Recipe Ethanol	Averaging No Oxygen	Flat No Oxygen	Recipe Ethanol	Averaging	
		RVPw	USban	USban	RVPw	Ethanol	No Oxygen
Case Number -->		7	2	2	7	8	2
							3
USE OF EXISTING CAPACITY							
Crude Distillation	Atmospheric	1,883	1,763	1,755	1,980	2,018	1,885
Conversion	Fluid Cat Cracker	681	665	670	716	732	689
	Hydrocracker - Distillate Feed	276	248	236	291	287	258
	Hydrocracker - Gas Oil Feed	137	130	124	143	143	130
	Coking - Delayed	358	325	323	381	391	355
	Coking - Fluid & Flexi	103	103	103	106	106	106
Upgrading	Alkylation	167	167	167	172	172	172
	Dimersol						5
	Pen/Hex Isomerization	61	84	84	67	61	86
	Polymerization	5	6	6	5	6	6
	Reforming (150-350 psi)	285	227	218	314	342	369
Oxygenate Prod.	MTBE Plant	12	1		12	12	12
	Tame Plant	2	2	2	2	2	2
Hydrotreating	Naphtha & Isom Feed Desulf.	70	72	72	74	85	79
	Reformer Feed Desulfurization	247	178	179	287	263	287
	Distillate Desulfurization	352	297	285	364	362	350
	Distillate Dearomatization	103	124	109	113	110	118
	FCC Feed Desulf. -- Conv.	325	305	306	342	349	329
	FCC Feed Desulf. -- Deep	352	330	331	370	379	356
	FCC Naphtha Hydrotreater	48	98	77	54	101	80
Hydrogen (foeb)	Benzene Saturation	29	58	64	29	54	66
	Hydrogen Plant (foeb)	60	59	58	65	64	58
Other	Butane Isomerization	18	18	18	18	18	18
	Lubes & Waxes	24	24	24	25	25	25
	Solvent Deasphalting	50	50	50	50	50	50
	Sulfur Recovery (K tons/d)	6	5	5	6	6	6
Fractionation	Debutanization	197	195	196	213	215	215
	Depentanization	60	60	60	60	60	60
	Lt. Naphtha Spl. (Benz. Prec.)	85	108	108	105	114	114
	FCC Naphtha Splitter	152	152	152	161	152	149
	FCC Naphtha T90 Control	161	161	161	171	171	171
NEW CAPACITY							
Upgrading	Alkylation		8			81	56
	Pen/Hex Isomerization		4				
	Polymerization					11	20
Hydrotreating	FCC Naphtha Hydrotreater						
	Benzene Saturation						
Hydrogen (foeb)	Hydrogen Plant (foeb)				0		
	Butane Isomerization					35	30
Other	Propane Dehydrogenation						31
	FCC Gas Processing					379	765
	Sulfur Recovery (K tons/d)				0		0
	Debutanization					14	19
	Depentanization					64	2
Fractionation	Lt. Naphtha Spl. (Benz. Prec.)		5	5		70	77
	Naphtha Splitter (T90 Control)				110		104
	Heavy Reformate Splitter				39		
	FCC Naphtha Splitter	8	8				
	FCC Naphtha (T90 Control)	8	8	8	60	48	43
OPERATIONS							
Operating Indices	FCC Conversion (Vol %)	73.6	77.7	78.8	73.7	75.0	74.4
	Reformer Severity (RON)	99.9	100.0	100.0	99.7	100.0	100.0
Charge Rates	Fluid Cat Cracker	681	638	640	716	732	689
	Reformer (150-350 psi)	285	122	218	315	342	369
FCC Olefin Max Cat. (%)						46.5	99.9
							100.0

Exhibit 5: Modeling Results --
**Process Unit Utilization, Additions, and Operations, by Case
(K bbl/d)
Supplement**

Type of Process	Process	Long Term			
		Mode			
		Flat			
		Ethanol		No Oxygen	
Case Number -->	BasU	BasU	HR 630	HR 630	
	USban	Alk-zero	USban	Alk-zero	
4	8	2		3	
USE OF EXISTING CAPACITY					
Crude Distillation	Atmospheric	2,018	2,025	1,916	2,020
Conversion	Fluid Cat Cracker	732	732	690	732
	Hydrocracker - Distillate Feed	289	289	282	291
	Hydrocracker - Gas Oil Feed	143	143	142	143
	Coking - Delayed	391	394	363	391
	Coking - Fluid & Flexi	106	106	106	106
Upgrading	Alkylation	172	172	172	172
	Dimersol				
	Pen/Hex Isomerization	54	56	86	86
	Polymerization	6	6	6	6
	Reforming (150-350 psi)	359	340	397	418
Oxygenate Prod.	MTBE Plant		12		12
	Tame Plant	2	2	2	2
Hydrotreating	Naphtha & Isom Feed Desulf.	103	115	71	79
	Reformer Feed Desulfurization	244	235	307	307
	Distillate Desulfurization	366	358	373	359
	Distillate Dearomatization	112	108	110	114
	FCC Feed Desulf. -- Conv.	349	349	329	349
	FCC Feed Desulf. -- Deep	379	379	357	379
	FCC Naphtha Hydrotreater	101	101	69	90
	Benzene Saturation	66	65	66	66
Hydrogen (foeb)	Hydrogen Plant (foeb)	64	64	59	63
Other	Butane Isomerization	18	18	18	18
	Lubes & Waxes	25	25	25	25
	Solvent Deasphalting	50	50	50	50
	Sulfur Recovery (K tons/d)	6	6	6	6
Fractionation	Debutanization	215	215	215	215
	Depentanization	60	60	60	60
	Lt. Naphtha Spl. (Benz. Prec.)	114	114	114	114
	FCC Naphtha Splitter	161	161	154	155
	FCC Naphtha T90 Control	171	171	171	171
NEW CAPACITY					
Upgrading	Alkylation	17	68	18	90
	Pen/Hex Isomerization				
	Polymerization	1	3	23	31
Hydrotreating	FCC Naphtha Hydrotreater				
	Benzene Saturation			0	
Hydrogen (foeb)	Hydrogen Plant (foeb)				
Other	Butane Isomerization	5	35	24	33
	Propane Dehydrogenation				
	FCC Gas Processing	162	254	430	578
	Sulfur Recovery (K tons/d)	0	0		0
Fractionation	Debutanization	9	12		18
	Depentanization	69	64		
	Lt. Naphtha Spl. (Benz. Prec.)	51	39	87	99
	Naphtha Splitter (T90 Control)			52	15
	Heavy Reformate Splitter				
	FCC Naphtha Splitter				
	FCC Naphtha (T90 Control)	61		51	51
OPERATIONS					
Operating Indices	FCC Conversion (Vol %)	74.6	75.0	73.0	75.0
	Reformer Severity (RON)	100.0	100.0	100.0	100.0
Charge Rates	Fluid Cat Cracker	732	732	690	732
	Reformer (150-350 psi)	359	340	397	418
FCC Olefin Max Cat. (%)		19.9	31.2	56.1	71.1

Exhibit 6A: Modeling Results -- Refinery Inputs, by Case
(K barrels/day)

Inputs	Intermediate Term													
	Averaging Mode													
	MTBE		No Oxy	Ethanol								TBA	ETBE	Mixed Oxy
	Ref	HR 630	HR630	BasU	BasU	BasU	HR630	RVPw	BasU	HR630	RVPw	BasU	BasU	BasU
Inputs	2002	HR 630	HR630	Alk-100	Alk-175	Alk-50	HR630	RVPw	USban	USban	USban	BasU	BasU	BasU
	1	2	1	1a	1b	1c	2	3	4	5	6	1	1	1
Crude Oil	1,876	1,880	1,756	1,739	1,759	1,698	see 1a	infeas	1,655	see 4	infeas	1,858	1,826	1,867
Specified Inputs	65	65	65	65	65	65			65			65	65	65
Propylene Alkylate	5	5	5	5	5	5			5			5	5	5
Butylene Alkylate	5	5	5	5	5	5			5			5	5	5
Heavy Gas Oils	18	18	18	18	18	18			18			18	18	18
Residuum	36	36	36	36	36	36			36			36	36	36
Isobutane	0	2	11	13	10	14			21			7	0	0
P1		2	11	12	10	12			12			7		
P2				1	0	2			9					
Isomerate	0	13	0	0	0	0			0			0	0	0
P1		10												
P2		3												
P3														
Mixed Alkylate	0	0	100	100	142	50			75			22	0	0
P1			16	16	27	8			16			16		
P2			22	22	36	11			21			6		
P3			62	62	79	31			38					
MTBE	108	94	6	3	0	5			0			23	0	16
P1	16	16	6	3	0	5						16		16
P2	25	25										7		
P3	67	53												
Ethanol	0	0	0	75	75	75			80			0	0	0
P1				51	51	51			65					
P2				10	10	10			15					
P3				14	14	14								
TBA	0	0	0	0	0	0			0			89	0	35
P1												69		35
P2												20		
P3														
ETBE	0	0	0	0	0	0			0			0	129	66
P1												90		66
P2												39		
P3														
TAME	0	0	0	0	0	0			0			0	0	0
P1														
P2														
P3														
CARBOB	0	0	255	65	0	175			171			0	0	0
P1			130	65		130			130					
P2			26			26			26					
P3			99			19			15					
Methanol	5	5	5	5	5	5			1			1	5	1
Distillate Blendstocks														
Jet Fuel				4	41	0	53			58				
EPA Diesel				50	19	40	26			35				
Purchased Energy														
Electricity (K Kwh)	15,582	15,915	14,490	14,105	14,696	13,509			13,309			15,896	14,674	15,437
Fuel (foeb)	198	197	190	182	189	178			177			193	209	199

Exhibit 6A: Modeling Results -- Refinery Inputs, by Case
(K barrels/day)

Inputs	Intermediate Term													
	Flat Limit Mode													
	MTBE				No Oxy	Ethanol					TBA	ETBE	Mixed Oxy	
	Ref 2002	Conv FCC Feed Hydro	Deep FCC Feed Hydro	HR 630		BasU	Alk-100	HR630	RVPw Conv Hyd	RVPw Deep Hyd				
1	1c	1d	2	1	1	2	3	3c	3d	1	1	1	1	
Crude Oil	1,872	1,869	1,889	1,899	1,806	1,798	see 1	1,795	1,892	1,522	1,899	1,822	1,890	
Specified Inputs	65	68	68	65	65	65		65	68	68	65	65	65	
Propylene Alkylate	5	6	6	5	5	5		5	6	6	5	5	5	
Butylene Alkylate	5	6	6	5	5	5		5	6	6	5	5	5	
Heavy Gas Oils	18	19	19	18	18	18		18	19	19	18	18	18	
Residuum	36	38	38	36	36	36		36	38	38	36	36	36	
Isobutane	0	0	0	3	7	11		0	3	0	4	0	0	
P1				3	7	11			3		4			
P2														
Isomerate	0	0	7	20	10	0		12	20	30	0	0	0	
P1			7	10	10			10	10	10				
P2				10				2	10	10				
P3										10				
Mixed Alkylate	0	0	0	0	100	100		38	10	100	0	0	0	
P1					16	16		16	10	16	0			
P2					22	22		22		22				
P3					62	62				62				
MTBE	108	108	108	75	12	4		16	10	21	24	0	16	
P1	16	16	16	16	12	4		16	10	16	16		16	
P2	25	25	25	25						5	8			
P3	67	67	67	34										
Ethanol	0	0	0	0	0	75		97	97	97	0	0	0	
P1						51		51	51	51				
P2						10		10	10	10				
P3						14		36	36	36				
TBA	0	0	0	0	0	0		0	0	0	84	0	65	
P1											69		65	
P2											15			
P3														
ETBE	0	0	0	0	0	0		0	0	0	0	129	25	
P1												90	25	
P2												39		
P3														
TAME	0	0	0	0	0	0		0	0	0	0	0	0	
P1														
P2														
P3														
CARBOB	0	0	0	0	140	0		0	0	0	0	0	0	
P1					130									
P2					10									
P3														
Methanol	5	5	5	5	5	5		1	4		1	5	1	
Distillate Blendstocks											11			
Jet Fuel								20			57			
EPA Diesel					44	52		1			114			
Purchased Energy														
Electricity (K Kwh)	15,363	16,245	15,476	16,213	14,903	14,886		15,861	16,561	14,202	16,094	14,519	15,890	
Fuel (foeb)	198	208	199	195	185	183		213	218	181	191	208	195	

Exhibit 6A: Modeling Results -- Refinery Inputs, by Case
(K barrels/day)

Inputs	Long Term													
	Averaging Mode													
	MTBE		No Oxy	Ethanol								TBA	ETBE	Mixed Oxy
	Ref 2005	HR 630	HR630	BasU Alk-100	BasU Alk-175	BasU Alk-50	HR630	RVPw	BasU USban	HR630 USban	RVPw USban	BasU	BasU	BasU
Inputs	1	2	1	1a	1b	1c	2	3	4	5	6	1	1	1
Crude Oil	1,985	1,993	1,908	1,957	1,921	1,986	see 1a	infeas	2,018	see 4	infeas	1,975	1,936	1,955
Specified Inputs	68	68	68	68	68	68			68			68	68	68
Propylene Alkylate	6	6	6	6	6	6			6			6	6	6
Butylene Alkylate	6	6	6	6	6	6			6			6	6	6
Heavy Gas Oils	19	19	19	19	19	19			19			19	19	19
Residuum	38	38	38	38	38	38			38			38	38	38
Isobutane	0	2	34	8	10	12			12			3	0	0
P1			2	12	8	10	12		12			3		
P2				22										
Isomerate	0	10	30	0	0	0			0			0	0	0
P1			10	10										
P2				10										
P3				10										
Mixed Alkylate	0	0	100	100	113	50			75			18	0	0
P1			16	16	27	8			16			16		0
P2			22	22	36	11			21			2		
P3			62	62	50	31			38					
MTBE	115	100	14	9	10	8			0			15	0	5
P1	31	31	14	9	10	8						15		5
P2	60	60												
P3	24	9												
Ethanol	0	0	0	79	79	79			85			0	0	0
P1				79	79	79			85					
P2														
P3														
TBA	0	0	0	0	0	0			0			104	0	25
P1												25		25
P2												48		
P3												31		
ETBE	0	0	0	0	0	0			0			0	137	101
P1												35		35
P2												102		66
P3														
TAME	0	0	0	0	0	0			0			0	0	0
P1														
P2														
P3														
CARBOB	0	0	40	0	0	23			0			0	0	0
P1			40			23								
P2														
P3														
Methanol	5	5	5	5	5	5			1			5	5	5
Distillate Blendstocks														
Jet Fuel														
EPA Diesel														
Purchased Energy														
Electricity (K Kwh)	16,575	17,004	17,374	16,817	16,444	17,016			17,411			17,122	15,638	16,056
Fuel (foeb)	208	208	212	205	206	214			215			202	219	213

Exhibit 6A: Modeling Results -- Refinery Inputs, by Case
(K barrels/day)

Inputs	Long Term													
	Flat Limit Mode													
	MTBE				No Oxy	Ethanol					TBA	ETBE	Mixed Oxy	
	Ref 2005	Conv FCC Feed Hydro	Deep FCC Feed Hydro	HR 630		BasU	Alk-100	HR630	RVPw Conv Hyd	RVPw Deep Hyd				
	1	1c	1d	2	1	1	2	3	3c	3d	1	1	1	
Crude Oil	1,981	2,006	2,010	2,018	1,988	1,982	see 1	1,945	1,946	1,972	2,014	1,931	1,955	
Specified Inputs	68	68	68	68	68	68		68	68	68	68	68	68	
Propylene Alkylate	6	6	6	6	6	6		6	6	6	6	6	6	
Butylene Alkylate	6	6	6	6	6	6		6	6	6	6	6	6	
Heavy Gas Oils	19	19	19	19	19	19		19	19	19	19	19	19	
Residuum	38	38	38	38	38	38		38	38	38	38	38	38	
Isobutane	0	0	0	1	12	4		6	5	9	2	0	0	
P1				1	12	4		6	5	9	2			
P2														
Isomerate	0	0	7	3	11	0		10	26	25	0	0	0	
P1			7	3	10			10	10	10				
P2					1				10	10				
P3									6	5				
Mixed Alkylate	0	0	0	0	100	86		28	9	0	5	0	0	
P1					16	16		16	9		5			
P2					22	22		12						
P3					62	48								
MTBE	115	115	115	91	19	5		7	6	7	13	0	2	
P1	31	31	31	31	19	5		7	6	7	13		2	
P2	60	60	60	60										
P3	24	24	24											
Ethanol	0	0	0	0	0	79		103	103	103	0	0	0	
P1						79		80	80	80				
P2								23	23	23				
P3											26			
TBA	0	0	0	0	0	0		0	0	0	99	0	25	
P1											25		25	
P2											48			
P3											26			
ETBE	0	0	0	0	0	0		0	0	0	0	137	101	
P1												35	35	
P2												102	66	
P3														
TAME	0	0	0	0	0	0		0	0	0	0	0	0	
P1														
P2														
P3														
CARBOB	0	0	0	0	20	0		0	0	0	0	0	0	
P1					20									
P2														
P3														
Methanol	5	5	5	5	5	5		5	5	5	5	5	5	
Distillate Blendstocks														
Jet Fuel														
EPA Diesel														
Purchased Energy														
Electricity (K Kwh)	16,358	17,343	16,339	17,064	17,470	16,803		17,091	17,505	16,815	17,145	15,428	15,919	
Fuel (foeb)	208	221	211	207	200	203		228	235	229	201	219	214	

Exhibit 6A: Modeling Results -- Refinery Inputs, by Case
 (K barrels/day)
 Supplement

Inputs	Intermediate Term			Long Term							
	Mode			Mode							
	Recipe Ethanol	Averaging No Oxygen	Flat No Oxygen	Recipe Ethanol	Averaging				Flat		
	RVPw	HR 630 USban	HR 630 USban	RVPw	BasU Alk-zero	HR 630 USban	HR 630 Alk-zero	BasU USban	BasU Alk-zero	HR 630 USban	HR 630 Alk-zero
	7	2	2	7	8	2	3	4	8	2	3
Crude Oil	1,882	1,763	1,755	1,980	2,018	1,884	2,014	2,018	2,025	1,916	2,020
Specified Inputs	65	65	65	68	68	68	68	68	68	68	68
Propylene Alkylate	5	5	5	6	6	6	6	6	6	6	6
Butylene Alkylate	5	5	5	6	6	6	6	6	6	6	6
Heavy Gas Oils	18	18	18	19	19	19	19	19	19	19	19
Residuum	36	36	36	38	38	38	38	38	38	38	38
Isobutane	4	15	9	0	35	44	99	12	22	12	47
P1		4	12	9		12	12	12	12	12	12
P2			3			23	32	87		10	35
Isomerate	0	0	0	0	0	30	30	0	0	28	20
P1							10	10		10	10
P2							10	10		10	10
P3							10	10		8	0
Mixed Alkylate	11	75	75	0	0	75	0	75	0	76	0
P1	11	16	16			16		16		16	
P2		21	21			21		21		22	
P3		38	38			38		38		38	
MTBE	16	0	0	21	18	0	12	0	20	0	21
P1	16			21	18	0	12	0	20	0	21
P2											
P3											
Ethanol	97	5	5	103	79	5	0	85	79	5	0
P1	51	5	5	80	79	5	0	85	79	5	
P2	10			23							
P3	36										
TBA	0	0	0	0	0	0	0	0	0	0	0
P1											
P2											
P3											
ETBE	0	0	0	0	0	0	0	0	0	0	0
P1											
P2											
P3											
TAME	0	0	0	0	0	0	0	0	0	0	0
P1											
P2											
P3											
CARBOB	0	328	265	0	0	130	0	0	0	105	20
P1		156	156			130				105	20
P2		44	44								
P3		128	65								
Methanol	5	1	1	5	5	1	5	1	5	1	5
Distillate Blendstocks											
Jet Fuel				4							
EPA Diesel		58	60								
Purchased Energy											
Electricity (K Kwh)	15,621	14,759	14,498	17,391	17,381	17,086	18,437	17,452	17,059	17,126	18,181
Fuel (foeb)	198	185	181	213	228	207	226	209	228	212	223

Exhibit 6B: Modeling Results -- Prices of Refinery Inputs, by Case
(\$ per barrel)

Inputs	Intermediate Term													
	Averaging Mode													
	MTBE		No Oxy	Ethanol								TBA	ETBE	Mixed Oxy
	Ref 2002	HR 630	HR630	BasU Alk-100	BasU Alk-175	BasU Alk-50	HR630	RVPw	BasU USban	HR630 USban	RVPw USban	BasU	BasU	BasU
1	2	1	1a	1b	1c	2	3	4	5	6	1	1	1	1
Isobutane														
P1	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19
P2	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36
Isomerate														
P1	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
P2	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00
P3	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00
Mixed Alkylate														
P1	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34
P2	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92
P3	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.44	34.44	34.44	34.44	34.23	34.23	34.23
MTBE														
P1	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92				31.92	31.92	31.92
P2	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86				34.86	34.86	34.86
P3	39.90	39.90	39.90	39.90	39.90	39.90	39.90	39.90				39.90	39.90	39.90
Ethanol														
P1				37.80	37.38	37.38	37.38	37.38	47.88	47.88	47.88			
P2				39.48	39.06	39.06	39.06	39.06	48.72	48.72	48.72			
P3				43.68	43.68	43.68	43.68	43.68	49.56	49.56	49.56			
TBA														
P1												38.64	38.64	38.64
P2												39.90	39.90	39.90
P3												41.58	41.58	41.58
ETBE														
P1												41.16	41.16	41.16
P2												44.52	44.52	44.52
P3												45.36	45.36	45.36
TAME														
P1												40.74	40.74	40.74
P2												41.58	41.58	41.58
P3												44.10	44.10	44.10
CARBOB														
P1		28.90	28.98	28.90	28.90	28.90	28.90	28.56	28.90	28.90	28.56	28.70	28.14	28.70
P2		29.06	29.11	29.06	29.06	29.06	29.06	28.77	29.06	29.06	30.24	28.85	28.35	28.85
P3		30.28	30.66	30.48	30.48	30.48	30.48	30.24	30.48	30.48	30.66	30.24	29.73	30.24
Methanol	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56
Distillate Blendstocks	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50
Jet Fuel	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50
EPA Diesel	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80

Exhibit 6B: Modeling Results -- Prices of Refinery Inputs, by Case
(\$ per barrel)

Inputs	Intermediate Term														
	Flat Limit Mode														
	MTBE				No Oxy	Ethanol						TBA	ETBE	Mixed Oxy	
	Ref 2002	Conv FCC Feed Hydro	Deep FCC Feed Hydro	HR 630		HR 630	Alk-100	HR630	RVPw	Conv Hyd	Deep Hyd				
	1	1c	1d	2	1	1	1	2	3	3c	3d	1	1	1	
Isobutane															
P1	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	
P2	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	
Isomerate															
P1	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	
P2	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	
P3	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	
Mixed Alkylate															
P1	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	
P2	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	
P3	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	
MTBE															
P1	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	
P2	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	
P3	39.90	39.90	39.90	39.90	39.90	39.90	39.90	39.90	39.90	39.90	39.90	39.90	39.90	39.90	
Ethanol															
P1						37.80	37.38	37.38	37.38	37.38	37.38				
P2						39.48	39.06	39.06	39.06	39.06	39.06				
P3						43.68	43.68	43.68	43.68	43.68	43.68				
TBA															
P1												38.64	38.64	38.64	
P2												39.90	39.90	39.90	
P3												41.58	41.58	41.58	
ETBE															
P1												41.16	41.16	41.16	
P2												44.52	44.52	44.52	
P3												45.36	45.36	45.36	
TAME															
P1												40.74	40.74	40.74	
P2												41.58	41.58	41.58	
P3												44.10	44.10	44.10	
CARBOB															
P1						28.90	28.98	28.90	28.90	28.56	28.56	28.56	28.70	28.14	28.70
P2						29.06	29.11	29.06	29.06	28.77	28.77	28.77	28.85	28.35	28.85
P3						30.28	30.66	30.48	30.48	30.24	30.24	30.24	30.24	29.73	30.24
Methanol	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	
Distillate Blendstocks	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	
Jet Fuel	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	
EPA Diesel	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	

Exhibit 6B: Modeling Results -- Prices of Refinery Inputs, by Case
(\$ per barrel)

Inputs	Long Term														
	Averaging Mode														
	MTBE			No Oxy	Ethanol								TBA	ETBE	Mixed Oxy
	Ref	2005	HR 630	HR630	BasU	BasU	BasU	HR630	RVPw	BasU	HR630	RVPw	BasU	BasU	BasU
Inputs	1	2	1	1a	1b	1c	2	3	4	5	6	1	1	1	
Isobutane															
P1	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19
P2	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36
Isomerate															
P1	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
P2	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00
P3	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00
Mixed Alkylate															
P1	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34
P2	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92
P3	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.44	34.44	34.44	34.23	34.23	34.23	34.23
MTBE															
P1	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92					31.92	31.92	31.92
P2	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86					34.86	34.86	34.86
P3	39.06	39.06	39.06	39.06	39.06	39.06	39.06	39.06					39.06	39.06	39.06
Ethanol															
P1				28.98	28.98	28.98	28.98	28.98	31.50	31.50	31.50				
P2				29.40	29.40	29.40	29.40	29.40	31.92	31.92	31.92				
P3				30.24	30.24	30.24	30.24	30.24							
TBA															
P1													32.76	32.76	32.76
P2													35.70	35.70	35.70
P3													37.38	37.38	37.38
ETBE															
P1													35.70	35.70	35.70
P2													37.38	37.38	37.38
P3															
TAME															
P1													40.74	40.74	40.74
P2													41.58	41.58	41.58
P3													44.10	44.10	44.10
CARBOB															
P1				28.98	28.90	28.90	28.90	28.90	28.90	28.90	28.90	28.56	28.70	28.14	28.14
P2				29.11	29.06	29.06	29.06	29.06	28.77	30.50	30.50	30.24	28.85	28.35	28.35
P3				30.66	30.48	30.48	30.48	30.48	30.24	30.90	30.90	30.66	30.24	29.73	29.73
Methanol	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56
Distillate Blendstocks	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50
Jet Fuel	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50
EPA Diesel	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80

Exhibit 6B: Modeling Results -- Prices of Refinery Inputs, by Case
(\$ per barrel)

Inputs	Long Term														
	Flat Limit Mode														
	MTBE				No Oxy	Ethanol						TBA	ETBE	Mixed Oxy	
	Ref 2005	Conv FCC Feed Hydro	Deep FCC Feed Hydro	HR 630		HR 630	Alk-100	HR630	RVPw	Conv Hyd	Deep Hyd				
	1	1c	1d	2	1	1	1	2	3	3c	3d	1	1	1	
Isobutane															
P1	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	
P2	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	
Isomerate															
P1	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	
P2	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	
P3	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	
Mixed Alkylate															
P1	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	
P2	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	
P3	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	
MTBE															
P1	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	
P2	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	
P3	39.06	39.06	39.06	39.06	39.06	39.06	39.06	39.06	39.06	39.06	39.06	39.06	39.06	39.06	
Ethanol															
P1							28.98	28.98	28.98	28.98	28.98				
P2							29.40	29.40	29.40	29.40	29.40				
P3							30.24	30.24	30.24	30.24	30.24				
TBA															
P1												32.76	32.76	32.76	
P2												35.70	35.70	35.70	
P3												37.38	37.38	37.38	
ETBE															
P1												35.70	35.70	35.70	
P2												37.38	37.38	37.38	
TAME															
P1												40.74	40.74	40.74	
P2												41.58	41.58	41.58	
P3												44.10	44.10	44.10	
CARBOB															
P1							28.98	28.90	28.90	28.56	28.56	28.56	28.70	28.14	28.14
P2							29.11	29.06	29.06	28.77	28.77	28.77	28.85	28.35	28.35
P3							30.66	30.48	30.48	30.24	30.24	30.24	30.24	29.73	29.73
Methanol	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	
Distillate Blendstocks	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	
Jet Fuel	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	
EPA Diesel	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	

Exhibit 6B: Modeling Results -- Prices of Refinery Inputs, by Case

(\$ per barrel)

Supplement

Inputs	Intermediate Term			Long Term							
	Mode			Mode							
	Recipe Ethanol	Averaging No Oxygen	Flat No Oxygen	Recipe Ethanol	Averaging			Flat			
					BasU	HR 630	HR 630	BasU	BasU	HR 630	HR 630
	RVPw	HR 630 USban	HR 630 USban	RVPw	Alk-zero	USban	Alk-zero	USban	Alk-zero	USban	Alk-zero
7	2	2	7	8	2	3	4	8	2	2	3
Isobutane											
P1	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19	22.19
P2	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36	24.36
Isomerate											
P1	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
P2	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00
P3	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00
Mixed Alkylate											
P1	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34	32.34
P2	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92	32.92
P3	34.23	34.44	34.44	34.23	0.00	34.44	0.00	34.44	0.00	34.44	0.00
MTBE											
P1	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92	31.92
P2	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86
P3	39.90	39.90	39.90	39.06	39.06	39.06	39.06	39.06	39.06	39.06	39.06
Ethanol											
P1	37.38	47.88	47.88	28.98	28.98	31.50		31.50	28.98	31.50	
P2	39.06	48.72	48.72	29.40	29.40	31.92		31.92	29.40	31.92	
P3	43.68	49.56	49.56	30.24	30.24				30.24		
TBA											
P1											
P2											
P3											
ETBE											
P1											
P2											
P3											
TAME											
P1											
P2											
P3											
CARBOB											
P1	28.56	28.98	28.98	28.56	28.90	28.98	28.98	28.90	28.90	28.90	28.98
P2	28.77	30.49	30.49	28.77	29.06	30.49	29.11	30.50	29.06	30.50	29.11
P3	30.24	30.66	30.66	30.24	30.48	30.66	30.66	30.90	30.48	30.90	30.66
Methanol	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56	28.56
Distillate Blendstocks	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50
Jet Fuel	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50
EPA Diesel	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80	25.80

Exhibit 6C: Modeling Results -- Availability of Refinery Inputs, by Case
(K bbl/d)

Inputs	Intermediate Term														
	Averaging Mode														
	MTBE		No Oxy	Ethanol									TBA	ETBE	Mixed Oxy
	Ref	2002	HR 630	HR630	BasU	BasU	BasU	HR630	RVPw	BasU	HR630	RVPw	BasU	BasU	BasU
Inputs	1	2	1	1a	1b	1c	2	3	4	5	6	1	1	1	
Isobutane															
P1	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
P2															
Isomerate															
P1	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
P2	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
P3	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Mixed Alkylate															
P1	16	16	16	16	27	8	16	16	16	16	16	16	16	16	16
P2	22	22	22	22	36	11	22	22	21	21	21	21	22	22	22
P3	62	62	62	62	108	31	62	62	38	38	38	38	62	62	62
MTBE															
P1	16	16	16	16	16	16	16	16	0	0	0	0	16	16	16
P2	25	25	25	25	25	25	25	25					25	25	25
P3															
Ethanol															
P1	0	0	0	51	51	51	51	51	67	67	67	0	0	0	0
P2				10	10	10	10	10	31	31	31				
P3				33	33	33	33	33							
TBA															
P1	0	0	0	0	0	0	0	0	0	0	0	0	69	69	69
P2													21	21	21
P3													35	35	35
ETBE															
P1	0	0	0	0	0	0	0	0	0	0	0	0	90	90	90
P2													60	60	60
P3													20	20	20
TAME															
P1	0	0	0	0	0	0	0	0	0	0	0	0	16	16	16
P2													16	16	16
P3													10	10	10
CARBOB															
P1	0	130	130	130	130	130	130	211	156	156	237	211	211	211	211
P2		26	26	26	26	26	26	26	138	138	270	26	26	26	26
P3		214	279	279	279	279	279	470	34	34	34	69			69
Methanol															
Distillate Blendstocks															
Jet Fuel															
EPA Diesel															

Exhibit 6C: Modeling Results -- Availability of Refinery Inputs, by Case
(K bbl/d)

Inputs	Intermediate Term													
	Flat Limit Mode													
	MTBE				No Oxy	Ethanol						TBA	ETBE	Mixed Oxy
	Ref 2002	Conv FCC	Deep FCC	HR 630		HR 630	Alk-100	HR630	RVPw	Conv Hyd	RVPw			
1	1c	1d	2	1	1	1		2	3	3c	3d	1	1	1
Isobutane														
P1	12	12	12	12	12	12	12	12	12	12	12	12	12	12
P2														
Isomerate														
P1	10	10	10	10	10	10	10	10	10	10	10	10	10	10
P2	10	10	10	10	10	10	10	10	10	10	10	10	10	10
P3	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Mixed Alkylate														
P1	16	16	16	16	16	16	16	16	16	16	16	16	16	16
P2	22	22	22	22	22	22	22	22	22	22	22	22	22	22
P3	62	62	62	62	62	62	62	62	62	62	62	62	62	62
MTBE														
P1	16	16	16	16	16	16	16	16	16	16	16	16	16	16
P2	25	25	25	25	25	25	25	25	25	25	25	25	25	25
P3														
Ethanol														
P1	0	0	0	0	0	51	51	51	51	51	51	0	0	0
P2						10	10	10	10	10	10			
P3						33	33		33	33	33			
TBA														
P1	0	0	0	0	0	0	0	0	0	0	0	69	69	69
P2												21	21	21
P3												35	35	35
ETBE														
P1	0	0	0	0	0	0	0	0	0	0	0	90	90	90
P2												60	60	60
P3												20	20	20
TAME														
P1	0	0	0	0	0	0	0	0	0	0	0	16	16	16
P2												16	16	16
P3												10	10	10
CARBOB														
P1	0	211	211	130	130	130	130	211	211	211	211	211	211	211
P2		26	26	26	26	26	26	26	26	26	26	26	26	26
P3		470	470	214	279	214	214	470	470	470	470	69		69
Methanol														
Distillate Blendstocks														
Jet Fuel														
EPA Diesel														

Exhibit 6C: Modeling Results -- Availability of Refinery Inputs, by Case
(K bbl/d)

Inputs	Long Term														
	Averaging Mode														
	MTBE		No Oxy	Ethanol								TBA	ETBE	Mixed Oxy	
	Ref	2005	HR 630	HR630	BasU	BasU	BasU	HR630	RVPw	BasU	HR630	RVPw	BasU	BasU	BasU
Inputs	1	2	1	1a	1b	1c	2	3	4	5	6	1	1	1	
Isobutane															
P1	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
P2															
Isomerate															
P1	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
P2	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
P3	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Mixed Alkylate															
P1	16	16	16	16	27	8	16	16	16	16	16	16	16	16	16
P2	22	22	22	22	36	11	22	22	21	21	21	21	22	22	22
P3	62	62	62	62	108	31	62	62	38	38	38	38	62	62	62
MTBE															
P1	31	31	31	31	31	31	31	31	0	0	0	31	31	31	31
P2	60	60	60	60	60	60	60	60				60	60	60	60
P3															
Ethanol															
P1	0	0	0	80	80	80	80	80	95	95	95	0	0	0	0
P2				40	40	40	40	40	5	5	5				
P3				70	70	70	70	70							
TBA															
P1	0	0	0	0	0	0	0	0	0	0	0	25	25	25	25
P2												48	48	48	48
P3															
ETBE															
P1	0	0	0	0	0	0	0	0	0	0	0	35	35	35	35
P2												170	170	170	170
P3															
TAME															
P1	0	0	0	0	0	0	0	0	0	0	0	16	16	16	16
P2												16	16	16	16
P3												10	10	10	10
CARBOB															
P1	0	130	130	130	130	130	130	211	156	156	237	211	211	211	211
P2		26	26	26	26	26	26	26	138	138	270	26	26	26	26
P3		214	279	214	214	214	214	470	34	34	34	69			69
Methanol															
Distillate Blendstocks															
Jet Fuel															
EPA Diesel															

Exhibit 6C: Modeling Results -- Availability of Refinery Inputs, by Case
(K bbl/d)

Inputs	Long Term													
	Flat Limit Mode													
	MTBE				No Oxy	Ethanol						TBA	ETBE	Mixed Oxy
	Ref 2005	Conv FCC	Deep FCC	HR 630		BasU		RVPw	RVPw	Conv Hyd	Deep Hyd			
	1	1c	1d	2	1	1	2	3	3c	3d	1	1	1	BasU
Isobutane														
P1	12	12	12	12	12	12	12	12	12	12	12	12	12	12
P2														
Isomerate														
P1	10	10	10	10	10	10	10	10	10	10	10	10	10	10
P2	10	10	10	10	10	10	10	10	10	10	10	10	10	10
P3	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Mixed Alkylate														
P1	16	16	16	16	16	16	16	16	16	16	16	16	16	16
P2	22	22	22	22	22	22	22	22	22	22	22	22	22	22
P3	62	62	62	62	62	62	62	62	62	62	62	62	62	62
MTBE														
P1	31	31	31	31	31	31	31	31	31	31	31	31	31	31
P2	60	60	60	60	60	60	60	60	60	60	60	60	60	60
P3														
Ethanol														
P1	0	0	0	0	0	80	80	80	80	80	0	0	0	0
P2						40	40	40	40	40				
P3						70	70	70	70	70				
TBA														
P1	0	0	0	0	0	0	0	0	0	0	25	25	25	
P2											48	48	48	
P3														
ETBE														
P1	0	0	0	0	0	0	0	0	0	0	35	35	35	
P2											170	170	170	
P3														
TAME														
P1	0	0	0	0	0	0	0	0	0	0	16	16	16	
P2											16	16	16	
P3											10	10	10	
CARBOB														
P1	0	130	130	130	130	130	130	211	211	211	211	211	211	211
P2		26	26	26	26	26	26	26	26	26	26	26	26	26
P3		214	214	214	279	214	214	470	470	470	470	69		
Methanol														
Distillate Blendstocks														
Jet Fuel														
EPA Diesel														

Exhibit 6C: Modeling Results -- Availability of Refinery Inputs, by Case

(K bbl/d)

Supplement

Inputs	Intermediate Term			Long Term							
	Mode			Mode							
	Recipe Ethanol	Averaging No Oxygen	Flat No Oxygen	Recipe Ethanol	Averaging			Flat			
					BasU	HR 630	HR 630	BasU	BasU	HR 630	HR 630
	RVPw	HR 630 USban	HR 630 USban	RVPw	Alk-zero	USban	Alk-zero	USban	Alk-zero	USban	Alk-zero
Isobutane											
P1	12	12	12	12	12	12	12	12	12	12	12
P2											
Isomerate											
P1	10	10	10	10	10	10	10	10	10	10	10
P2	10	10	10	10	10	10	10	10	10	10	10
P3	10	10	10	10	10	10	10	10	10	10	10
Mixed Alkylate											
P1	16	16	16	16	0	16	0	16	0	16	0
P2	22	21	21	22	0	21	0	21	0	21	0
P3	62	38	38	62	0	38	0	38	0	38	0
MTBE											
P1	16	16	16	31	31	31	31	0	31	0	31
P2	25	25	25	25	60	60	60	60	60	60	60
P3											
Ethanol											
P1	51	67	67	80	80	95	0	95	80	95	0
P2	10	31	31	40	40	5		5	40	5	
P3				70	70	0			70		
TBA											
P1	0	0	0	0	0	0	0	0	0	0	0
P2											
P3											
ETBE											
P1	0	0	0	0	0	0	0	0	0	0	0
P2											
P3											
TAME											
P1	0	0	0	0	0	0	0	0	0	0	0
P2											
P3											
CARBOB											
P1	211	156	156	211	130	156	130	156	130	156	130
P2	26	44	44	26	26	44	26	138	26	138	26
P3	470	128	128	470	214	128	279	34	214	34	279
Methanol											
Distillate Blendstocks											
Jet Fuel											
EPA Diesel											

Exhibit 6D: Cost Adjustment for Blendstock and Refined Product Supply Curves
(\$K/day)

E

Inputs	Intermediate Term													
	Averaging Mode													
	MTBE		No Oxy	Ethanol								TBA	ETBE	Mixed Oxy
	Ref 2002	HR 630	HR630	BasU Alk-100	BasU Alk-175	BasU Alk-50	HR630	RVPw	BasU USban	HR630 USban	RVPw USban	BasU	BasU	BasU
	1	2	1	1a	1b	1c	2	3	4	5	6	1	1	1
Isobutane														
ARMS Cost	0	47	234	294	219	324	0	0	488	0	0	154	0	0
Market Cost	0	47	234	320	219	350	0	0	514	0	0	154	0	0
Adjustment	0	0	0	26	0	26	0	0	26	0	0	0	0	0
Isomerate														
ARMS Cost	0	342	0	0	0	0	0	0	0	0	0	0	0	0
Market Cost	0	352	0	0	0	0	0	0	0	0	0	0	0	0
Adjustment	0	10	0	0	0	0	0	0	0	0	0	0	0	0
Mixed Alkylate														
ARMS Cost	0	0	3,364	3,364	4,751	1,682	0	0	2,517	0	0	723	0	0
Market Cost	0	0	3,423	3,423	4,849	1,712	0	0	2,583	0	0	732	0	0
Adjustment	0	0	59	59	98	30	0	0	66	0	0	9	0	0
MTBE														
ARMS Cost	4,045	3,494	201	100	1	147	0	0	0	0	0	753	0	511
Market Cost	4,299	3,747	201	100	1	147	0	0	0	0	0	800	0	511
Adjustment	254	254	0	0	0	0	0	0	0	0	0	47	0	0
Ethanol														
ARMS Cost	0	0	0	2,927	2,903	2,898	0	0	3,830	0	0	0	0	0
Market Cost	0	0	0	3,269	3,270	3,265	0	0	3,884	0	0	0	0	0
Adjustment	0	0	0	342	368	368	0	0	55	0	0	0	0	0
TBA														
ARMS Cost	0	0	0	0	0	0	0	0	0	0	0	3,452	0	1,351
Market Cost	0	0	0	0	0	0	0	0	0	0	0	3,539	0	1,351
Adjustment	0	0	0	0	0	0	0	0	0	0	0	87	0	0
ETBE														
ARMS Cost	0	0	0	0	0	0	0	0	0	0	0	5,444	0	2,720
Market Cost	0	0	0	0	0	0	0	0	0	0	0	5,746	0	2,720
Adjustment	0	0	0	0	0	0	0	0	0	0	0	302	0	0
TAME														
ARMS Cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Market Cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Adjustment	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CARBOB														
ARMS Cost	0	0	7,560	1,867	0	5,103	0	0	4,962	0	0	0	0	0
Market Cost	0	0	7,818	1,867	0	5,345	0	0	5,205	0	0	0	0	0
Adjustment	0	0	259	0	0	242	0	0	242	0	0	0	0	0
Total Adjustment	254	264	318	427	466	665	0	0	388	0	0	143	302	0

Exhibit 6D: Cost Adjustment for Blendstock and Refined Product Supply Curves
(\$K/day)

Inputs	Intermediate Term													
	Flat Limit Mode													
	MTBE				No Oxy	Ethanol					TBA	ETBE	Mixed Oxy	
	Ref 2002	Conv FCC Feed Hydro	Deep FCC Feed Hydro	HR 630		HR 630	Alk-100	HR630	RVPw	RVPw				
	1	1c	1d	2	1	1	2	3	3c	3d	1	1	1	
Isobutane														
ARMS Cost	0	0	0	65	156	245	0	0	56	0	94	0	0	0
Market Cost	0	0	0	65	156	245	0	0	56	0	94	0	0	0
Adjustment	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Isomerate														
ARMS Cost	0	0	188	518	260	0	0	324	530	810	0	0	0	0
Market Cost	0	0	188	528	260	0	0	334	540	840	0	0	0	0
Adjustment	0	0	0	10	0	0	0	10	10	30	0	0	0	0
Mixed Alkylate														
ARMS Cost	0	0	0	0	3,364	3,364	0	1,242	308	3,364	15	0	0	0
Market Cost	0	0	0	0	3,423	3,423	0	1,251	308	3,423	15	0	0	0
Adjustment	0	0	0	0	59	59	0	9	0	59	0	0	0	0
MTBE														
ARMS Cost	4,045	4,045	4,045	2,722	391	128	0	511	303	676	779	0	511	
Market Cost	4,299	4,299	4,299	2,976	391	128	0	511	303	723	826	0	511	
Adjustment	254	254	254	254	0	0	0	0	0	47	47	0	0	0
Ethanol														
ARMS Cost	0	0	0	0	0	2,903	0	3,872	3,872	3,872	0	0	0	0
Market Cost	0	0	0	0	0	3,270	0	4,239	4,239	4,239	0	0	0	0
Adjustment	0	0	0	0	0	368	0	368	368	368	0	0	0	0
TBA														
ARMS Cost	0	0	0	0	0	0	0	0	0	0	3,273	0	2,501	
Market Cost	0	0	0	0	0	0	0	0	0	0	3,360	0	2,501	
Adjustment	0	0	0	0	0	0	0	0	0	0	87	0	0	0
ETBE														
ARMS Cost	0	0	0	0	0	0	0	0	0	0	0	5,444	1,035	
Market Cost	0	0	0	0	0	0	0	0	0	0	0	5,746	1,035	
Adjustment	0	0	0	0	0	0	0	0	0	0	0	302	0	0
TAME														
ARMS Cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Market Cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Adjustment	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CARBOB														
ARMS Cost	0	0	0	0	4,059	0	0	0	0	0	0	0	0	0
Market Cost	0	0	0	0	4,075	0	0	0	0	0	0	0	0	0
Adjustment	0	0	0	0	17	0	0	0	0	0	0	0	0	0
Total Adjustment	254	254	254	264	76	427	0	387	378	504	134	302	0	

Exhibit 6D: Cost Adjustment for Blendstock and Refined Product Supply Curves
(\$K/day)

E

Inputs	Long Term														
	Averaging Mode														
	MTBE			No Oxy	Ethanol								TBA	ETBE	Mixed Oxy
	Ref				BasU	BasU	BasU	HR630	RVPw	BasU	HR630	RVPw			
	2005	HR 630	HR630	Alk-100	Alk-175	Alk-50				USban	USban	USban	BasU	BasU	BasU
1	2	1	1a	1b	1c	2	3	4	5	6	1	1	1		
Isobutane															
ARMS Cost	0	52	813	183	218	266	0	0	266	0	0	72	0	0	0
Market Cost	0	52	839	183	218	266	0	0	266	0	0	72	0	0	0
Adjustment	0	0	26	0	0	0	0	0	0	0	0	0	0	0	0
Isomerate															
ARMS Cost	0	260	808	0	0	0	0	0	0	0	0	0	0	0	0
Market Cost	0	260	838	0	0	0	0	0	0	0	0	0	0	0	0
Adjustment	0	0	30	0	0	0	0	0	0	0	0	0	0	0	0
Mixed Alkyllate															
ARMS Cost	0	0	3,364	3,364	3,765	1,682	0	0	2,517	0	0	592	0	0	0
Market Cost	0	0	3,423	3,423	3,863	1,712	0	0	2,583	0	0	601	0	0	0
Adjustment	0	0	59	59	98	30	0	0	66	0	0	9	0	0	0
MTBE															
ARMS Cost	4,017	3,449	447	280	318	259	0	0	0	0	0	478	0	0	154
Market Cost	4,491	3,922	447	280	318	259	0	0	0	0	0	478	0	0	154
Adjustment	473	473	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethanol															
ARMS Cost	0	0	0	2,298	2,298	2,297	0	0	2,664	0	0	0	0	0	0
Market Cost	0	0	0	2,298	2,298	2,297	0	0	2,664	0	0	0	0	0	0
Adjustment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TBA															
ARMS Cost	0	0	0	0	0	0	0	0	0	0	0	3,695	0	0	819
Market Cost	0	0	0	0	0	0	0	0	0	0	0	3,891	0	0	819
Adjustment	0	0	0	0	0	0	0	0	0	0	0	196	0	0	0
ETBE															
ARMS Cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,051
Market Cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,761
Adjustment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	59
TAME															
ARMS Cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Market Cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Adjustment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CARBOB															
ARMS Cost	0	0	1,159	0	0	667	0	0	0	0	0	0	0	0	0
Market Cost	0	0	1,159	0	0	667	0	0	0	0	0	0	0	0	0
Adjustment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Adjustment	473	473	115	59	98	30	0	0	66	0	0	205	59	59	

Exhibit 6D: Cost Adjustment for Blendstock and Refined Product Supply Curves
(\$K/day)

Inputs	Long Term												
	Flat Limit Mode												
	MTBE				No Oxy	Ethanol					TBA	ETBE	Mixed Oxy
	Ref 2005	Conv FCC	Deep FCC	HR 630		BasU	Alk-100	HR630	RVPw	RVPw			
	1	1c	1d	2	1	1	2	3	3c	3d	1	1	1
Isobutane													
ARMS Cost	0	0	0	29	266	93	0	131	120	198	39	0	0
Market Cost	0	0	0	29	266	93	0	131	120	198	39	0	0
Adjustment	0	0	0	0	0	0	0	0	0	0	0	0	0
Isomerate													
ARMS Cost	0	0	176	82	282	0	0	260	688	661	0	0	0
Market Cost	0	0	176	82	292	0	0	260	718	691	0	0	0
Adjustment	0	0	0	0	10	0	0	0	30	30	0	0	0
Mixed Alkylate													
ARMS Cost	0	0	0	0	3,353	2,894	0	897	298	0	154	0	0
Market Cost	0	0	0	0	3,412	2,953	0	906	298	0	154	0	0
Adjustment	0	0	0	0	59	59	0	9	0	0	0	0	0
MTBE													
ARMS Cost	4,017	4,017	4,017	3,081	613	162	0	222	185	234	418	0	51
Market Cost	4,491	4,491	4,491	3,172	613	162	0	222	185	234	418	0	51
Adjustment	473	473	473	91	0	0	0	0	0	0	0	0	0
Ethanol													
ARMS Cost	0	0	0	0	0	2,298	0	2,988	2,988	2,988	0	0	0
Market Cost	0	0	0	0	0	2,298	0	3,022	3,022	3,022	0	0	0
Adjustment	0	0	0	0	0	0	0	34	34	34	0	0	0
TBA													
ARMS Cost	0	0	0	0	0	0	0	0	0	0	3,518	0	819
Market Cost	0	0	0	0	0	0	0	0	0	0	3,714	0	819
Adjustment	0	0	0	0	0	0	0	0	0	0	196	0	0
ETBE													
ARMS Cost	0	0	0	0	0	0	0	0	0	0	0	5,051	3,702
Market Cost	0	0	0	0	0	0	0	0	0	0	0	5,110	3,761
Adjustment	0	0	0	0	0	0	0	0	0	0	0	59	59
TAME													
ARMS Cost	0	0	0	0	0	0	0	0	0	0	0	0	0
Market Cost	0	0	0	0	0	0	0	0	0	0	0	0	0
Adjustment	0	0	0	0	0	0	0	0	0	0	0	0	0
CARBOB													
ARMS Cost	0	0	0	0	580	0	0	0	0	0	0	0	0
Market Cost	0	0	0	0	580	0	0	0	0	0	0	0	0
Adjustment	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Adjustment	473	473	473	91	69	59	0	43	64	64	196	59	59

I Exhibit 6D: Cost Adjustment for Blendstock and Refined Product Supply Curves

(\$K/day)

Supplement

Inputs	Intermediate Term			Long Term							
	Mode			Mode							
	Recipe Ethanol	Averaging No Oxygen	Flat No Oxygen	Recipe Ethanol	Averaging			Flat			
	RVPw	HR 630 USban	HR 630 USban	RVPw	BasU	HR 630 USban	HR 630 Alk-zero	BasU	BasU	HR 630 USban	HR 630 Alk-zero
	7	2	2	7	824	1,036	2,379	266	512	266	1,127
Isobutane											
ARMS Cost	96	339	203	0	824	1,036	2,379	266	512	266	1,127
Market Cost	96	365	203	0	851	1,062	2,405	266	538	266	1,153
Adjustment	0	26	0	0	26	26	26	0	26	0	26
Isomerate											
ARMS Cost	0	0	0	0	0	810	810	0	0	757	538
Market Cost	0	0	0	0	0	840	840	0	0	787	568
Adjustment	0	0	0	0	0	30	30	0	0	30	30
Mixed Alkylate											
ARMS Cost	345	2,517	2,517	0	0	2,517	0	2,517	0	2,550	0
Market Cost	345	2,583	2,583	0	0	2,583	0	2,583	0	2,617	0
Adjustment	0	66	66	0	0	66	0	66	0	67	0
MTBE											
ARMS Cost	511	0	0	655	585	0	393	0	653	0	655
Market Cost	511	0	0	655	585	0	393	0	653	0	655
Adjustment	0	0	0	0	0	0	0	0	0	0	0
Ethanol											
ARMS Cost	3,872	238	238	2,988	2,298	166	0	2,664	2,298	166	0
Market Cost	4,239	238	238	3,022	2,298	166	0	2,664	2,298	166	0
Adjustment	368	0	0	34	0	0	0	0	0	0	0
TBA											
ARMS Cost	0	0	0	0	0	0	0	0	0	0	0
Market Cost	0	0	0	0	0	0	0	0	0	0	0
Adjustment	0	0	0	0	0	0	0	0	0	0	0
ETBE											
ARMS Cost	0	0	0	0	0	0	0	0	0	0	0
Market Cost	0	0	0	0	0	0	0	0	0	0	0
Adjustment	0	0	0	0	0	0	0	0	0	0	0
TAME											
ARMS Cost	0	0	0	0	0	0	0	0	0	0	0
Market Cost	0	0	0	0	0	0	0	0	0	0	0
Adjustment	0	0	0	0	0	0	0	0	0	0	0
CARBOB											
ARMS Cost	0	9,787	7,855	0	0	3,767	0	0	0	3,035	580
Market Cost	0	10,056	8,125	0	0	3,767	0	0	0	3,035	580
Adjustment	0	270	270	0	0	0	0	0	0	0	0
Total Adjustment	368	361	335	34	26	122	56	66	26	97	56

Exhibit 7: Modeling Results -- Refined Product Outputs and Sales of Rejected Blendstocks, by Case
(K barrels/day)

F

Outputs	Intermediate Term													
	Averaging Mode													
	MTBE		No Oxy	Ethanol								TBA	ETBE	Mixed Oxy
	Ref	HR 630	HR630	BasU	BasU	BasU	HR630	RVPw	BasU	HR630	RVPw	BasU	BasU	BasU
	2002	HR 630	HR630	Alk-100	Alk-175	Alk-50	HR630	RVPw	USban	USban	USban	BasU	BasU	BasU
1	2	1	1a	1b	1c	2	3	4	5	6		1	1	1
REFINED PRODUCTS*	2,114	2,114	1,792	1,973	2,060	1,831	see 1a	infeas	1,819	see 4	infeas	2,109	2,108	2,113
Propane	36	36	36	36	36	36			36			36	36	36
Propylene	2	2	2	2	2	2			2			2	2	2
Butane	29	29	29	29	29	29			29			29	29	29
Mixed Butylenes	4	4	1	4		4			4			0	2	4
Naphtha	3	3	3	3	3	3			3			3	3	3
Gasoline:														
California RFG	965	965	710	895	965	775			780			965	965	965
Arizona RFG	64	64	64	64	64	64			64			64	64	64
Conventional	150	150	150	150	150	150			150			150	150	150
Aviation Gasoline	5	5	5	5	5	5			5			5	5	5
Jet Fuel	319	319	315	278	319	266			261			319	319	319
Diesel Fuel:														
CARB Diesel	192	192	192	192	192	192			192			192	192	192
EPA Diesel	114	114	64	95	74	88			79			114	114	114
Other	17	17	17	17	17	17			17			17	17	17
Lubes & Waxes	24	24	24	24	24	24			24			24	24	24
Residual Fuel Oil	55	55	55	57	55	57			57			55	55	55
Asphalt														
Coke	135	135	125	123	125	119			116			133	131	134
Sulfur (K tons/d)	6	6	5	5	5	5			5			6	5	6
REJECTED BLENDSTOCKS	0	0	203	64	50	106			99			3	0	0
Mixed Butylenes									2					
Pentanes			0	2	0	2			2					
Light Coker Naphtha						21			11					
Light FCC Gasoline			8	19	18	19			19					
Heavy FCC Gasoline			9	12	9	11			11			3		
Naphtha (250 - 325 °F)			158	31	24	53			54					
Heavy Reformate			28						0					
TOTAL	2,114	2,114	1,995	2,037	2,110	1,938			1,919			2,112	2,108	2,113

* Excludes Sulfur

Exhibit 7: Modeling Results -- Refined Product Outputs and Sales of Rejected Blendstocks, by Case E
(K barrels/day)

Outputs	Intermediate Term													
	Flat Limit Mode													
	MTBE					No Oxy	Ethanol					TBA	ETBE	Mixed Oxy
	Ref	Conv FCC	Deep FCC	HR 630	HR 630		BasU	Alk-100	HR630	RVPw	RVPw			
	2002	Feed Hydro	Feed Hydro	HR 630	HR 630					Conv Hyd	Deep Hyd	BasU	BasU	BasU
1	1c	1d	2	1	1		1	2	3	3c	3d	1	1	1
REFINED PRODUCTS*	2,114	2,098	2,098	2,116	1,924	2,055	see 1		2,085	2,103	1,910	2,124	2,106	2,115
Propane	36	36	36	36	36	36			36	36	36	36	36	36
Propylene	2	2	2	2	2	2			2	2	2	2	2	2
Butane	29	29	29	29	29	29			29	29	29	29	29	29
Mixed Butylenes	4	3		4	4	4						4		4
Naphtha	3	3	3	3	3	3			3	3	3	3	3	3
Gasoline:														
California RFG	965	965	965	965	825	965			965	965	965	965	965	965
Arizona RFG	64	64	64	64	64	64			64	64	64	64	64	64
Conventional	150	150	150	150	150	150			150	150	150	150	150	150
Aviation Gasoline	5	5	5	5	5	5			5	5	5	5	5	5
Jet Fuel	319	319	319	319	319	319			299	319	262	319	319	319
Diesel Fuel:														
CARB Diesel	192	192	192	192	192	192			192	192	192	192	192	192
EPA Diesel	114	114	114	114	70	62			113	114		114	114	114
Other	17	17	17	17	17	17			17	17	17	17	17	17
Lubes & Waxes	24	24	24	24	24	24			24	24	24	24	24	24
Residual Fuel Oil	55	40	40	55	55	55			55	40	40	63	55	55
Asphalt														
Coke	135	135	137	137	129	128			131	143	121	137	131	136
Sulfur (K tons/d)	6	6	6	6	5	5			5	6	4	6	5	6
REJECTED BLENDSTOCKS	0	0	0	0	126	42			14	56	0	0	0	0
Mixed Butylenes														
Pentanes					0	2								
Light Coker Naphtha						1								
Light FCC Gasoline						20			14	38				
Heavy FCC Gasoline					9	11				18				
Naphtha (250 - 325 °F)					116	7								
Heavy Reformate														
TOTAL	2,114	2,098	2,098	2,116	2,050	2,097			2,099	2,159	1,910	2,124	2,106	2,115

* Excludes Sulfur

Exhibit 7: Modeling Results -- Refined Product Outputs and Sales of Rejected Blendstocks, by Case
(K barrels/day)

F

Outputs	Long Term													
	Averaging Mode													
	MTBE		No Oxy	Ethanol								TBA	ETBE	Mixed Oxy
	Ref	HR 630	HR630	BasU	BasU	BasU	HR630	RVPw	BasU	HR630	RVPw	BasU	BasU	BasU
	2005	HR 630	HR630	Alk-100	Alk-175	Alk-50	HR630	RVPw	USban	USban	USban	BasU	BasU	BasU
1	2	1	1a	1b	1c	2	3	4	5	6	1	1	1	1
REFINED PRODUCTS*	2,235	2,237	2,190	2,234	2,231	2,211	see 1a	infeas	2,238	see 4	infeas	2,235	2,231	2,233
Propane	37	37	37	37	37	37			37			37	37	37
Propylene	2	2	2	2	2	2			2			2	2	2
Butane	30	30	30	30	30	30			30			30	30	30
Mixed Butylenes	4	4	4	4	4	4			4			4	4	4
Naphtha	3	3	3	3	3	3			3			3	3	3
Gasoline:														
California RFG	1,022	1,022	982	1,022	1,022	997			1,022			1,022	1,022	1,022
Arizona RFG	68	68	68	68	68	68			68			68	68	68
Conventional	161	161	161	161	161	161			161			161	161	161
Aviation Gasoline	5	5	5	5	5	5			5			5	5	5
Jet Fuel	333	333	333	333	333	333			333			333	333	333
Diesel Fuel:														
CARB Diesel	204	204	204	204	204	204			204			204	204	204
EPA Diesel	122	122	122	122	122	122			122			122	122	122
Other	18	18	18	18	18	18			18			18	18	18
Lubes & Waxes	25	25	25	25	25	25			25			25	25	25
Residual Fuel Oil	57	58	59	58	59	58			57			58	57	57
Asphalt														
Coke	144	144	137	141	138	144			147			143	140	142
Sulfur (K tons/d)	6	6	6	6	6	6			6			6	6	6
REJECTED BLENDSTOCKS	0	16	45	29	49				78			0	0	0
Mixed Butylenes			16	12		10			36					
Pentanes				25	24	25			25					
Light Coker Naphtha														
Light FCC Gasoline				8	5	15			17					
Heavy FCC Gasoline														
Naphtha (250 - 325 °F)														
Heavy Reformate														
TOTAL		2,237	2,205	2,278	2,259	2,260			2,316			2,235	2,231	2,233

* Excludes Sulfur

Exhibit 7: Modeling Results -- Refined Product Outputs and Sales of Rejected Blendstocks, by Case
(K barrels/day)

Outputs	Long Term													
	Flat Limit Mode													
	MTBE					No Oxy	Ethanol					TBA	ETBE	Mixed Oxy
	Ref	Conv FCC	Deep FCC	HR 630	HR 630	BasU	Alk-100	HR630	RVPw	RVPw	Conv Hyd	Deep Hyd	BasU	BasU
	2005	Feed Hydro	Feed Hydro	HR 630	HR 630	1	1	2	3	3c	3d	1	1	1
REFINED PRODUCTS*	2,235	2,222	2,218	2,243	2,215	2,236	see 1	2,235	2,217	2,215	2,252	2,230	2,233	
Propane	37	37	37	37	37	37		37	37	37	37	37	37	37
Propylene	2	2	2	2	2	2		2	2	2	2	2	2	2
Butane	30	30	30	30	30	30		30	30	30	30	30	30	30
Mixed Butylenes	4	4		4	4	4			4		4	3	4	
Naphtha	3	3	3	3	3	3		3	3	3	3	3	3	3
Gasoline:														
California RFG	1,022	1,022	1,022	1,022	1,002	1,022		1,022	1,022	1,022	1,022	1,022	1,022	1,022
Arizona RFG	68	68	68	68	68	68		68	68	68	68	68	68	68
Conventional	161	161	161	161	161	161		161	161	161	161	161	161	161
Aviation Gasoline	5	5	5	5	5	5		5	5	5	5	5	5	5
Jet Fuel	333	333	333	333	333	333		333	333	333	333	333	333	333
Diesel Fuel:														
CARB Diesel	204	204	204	204	204	204		204	204	204	204	204	204	204
EPA Diesel	122	122	122	122	122	122		122	122	122	122	122	122	122
Other	18	18	18	18	18	18		18	18	18	18	18	18	18
Lubes & Waxes	25	25	25	25	25	25		25	25	25	25	25	25	25
Residual Fuel Oil	57	41	41	63	57	58		64	41	41	72	57	57	57
Asphalt														
Coke	144	146	147	146	144	143		141	141	144	146	140	142	
Sulfur (K tons/d)	6	6	6	6	6	6		6	6	6	6	6	6	6
REJECTED BLENDSTOCKS	0	0	0	0	29	44		8	7	0	0	0	0	0
Mixed Butylenes					29	8								
Pentanes						24								
Light Coker Naphtha														
Light FCC Gasoline						12		8	7					
Heavy FCC Gasoline														
Naphtha (250 - 325 °F)														
Heavy Reformate														
TOTAL	2,235	2,222	2,218	2,243	2,244	2,280		2,243	2,224	2,215	2,252	2,230	2,233	

* Excludes Sulfur

Exhibit 7: Modeling Results -- Refined Product Outputs and Sales of Rejected Blendstocks, by Case

(K barrels/day)

Supplement

Outputs	Intermediate Term			Long Term							
	Mode			Mode							
	Recipe Ethanol	Averaging No Oxygen	Flat No Oxygen	Recipe Ethanol	Averaging			Flat			
	RVPw	HR 630 USban	HR 630 USban	RVPw	BasU	HR 630	HR 630	BasU	BasU	HR 630 USban	HR 630 Alk-zero
	7	2	2	7	8	2	3	4	8	2	3
REFINED PRODUCTS*	2,111	1,719	1,774	2,243	2,238	2,098	2,238	2,238	2,239	2,125	2,218
Propane	36	36	36	37	37	37	37	37	37	37	37
Propylene	2	2	2	2	2	2	2	2	2	2	2
Butane	29	29	29	30	30	30	30	30	30	30	30
Mixed Butylenes		4	4	3	4	4	4	4	4	4	4
Naphtha	3	3	3	3	3	3	3	3	3	3	3
Gasoline:											
California RFG	965	637	700	1,022	1,022	892	1,022	1,022	1,022	917	1,002
Arizona RFG	64	64	64	68	68	68	68	68	68	68	68
Conventional	150	150	150	161	161	161	161	161	161	161	161
Aviation Gasoline	5	5	5	5	5	5	5	5	5	5	5
Jet Fuel	319	319	315	333	333	333	333	333	333	333	333
Diesel Fuel:											
CARB Diesel	192	192	192	204	204	204	204	204	204	204	204
EPA Diesel	114	56	54	122	122	122	122	122	122	122	122
Other	17	17	17	18	18	18	18	18	18	18	18
Lubes & Waxes	24	24	24	25	25	25	25	25	25	25	25
Residual Fuel Oil	55	55	55	67	57	59	57	57	57	59	57
Asphalt											
Coke	135	125	124	143	147	135	146	147	147	138	147
Sulfur (K tons/d)	6	5	5	6	6	6	6	6	6	6	6
REJECTED BLENDSTOCKS	12	217	179	0	44	50	29	71	43	30	4
Mixed Butylenes			6		4	44	29	27	3	29	4
Pentanes		2	0		25	0		25	25		
Light Coker Naphtha											
Light FCC Gasoline			6	9		15	5		19	15	1
Heavy FCC Gasoline	12	12	9								
Naphtha (250 - 325 °F)		171	153								
Heavy Reformate			27								
TOTAL	2,122	1,936	1,953	2,243	2,282	2,147	2,267	2,309	2,282	2,156	2,222

* Excludes Sulfur

Exhibit 8: Modeling Results -- Gasoline Properties, by Case and Gasoline Type

Property & Predictive Model	Intermediate Term Averaging Mode																				
	MTBE						No Oxygenate			Ethanol											
	Ref 2002		HR 630		HR630			BasU Alk-100			BasU Alk-175			BasU Alk-50			HR630				
	1	2	1	2	1	2	1	1a	1b	1c	2	1	2	1	2	1	2	1	2	1	
% Emissions	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.
Property																					
RVP (psi) (1)	6.8	6.6	7.7	6.8	6.6	7.7	6.8	6.6	7.7	5.5	6.6	7.7	5.5	6.6	7.7	5.5	6.6	7.7	see 1a		
Oxygen (wt%)	2.1	2.1	0.3	1.8	2.7	0.3	0.0	2.7	1.2	2.7	2.7	0.9	2.7	2.7	0.5	2.7	2.7	1.0			
Aromatics (vol%)	23.2	22.6	34.4	23.7	21.1	34.4	16.7	28.0	34.4	18.8	28.0	34.4	17.9	27.8	34.4	19.9	28.0	34.4			
Benzene (vol%)	0.53	0.80	0.80	0.54	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80		
Olefins (vol%)	4.4	5.6	12.4	4.3	5.6	12.4	3.7	5.6	12.4	2.9	5.6	12.1	2.9	5.6	12.4	2.8	5.6	11.9			
Sulfur (ppm)	19	38	153	19	38	153	16	38	106	25	30	71	27	38	75	23	30	95			
E200 (vol% off)	50.5	43.0	38.9	50.5	43.0	38.9	52.0	47.2	41.8	48.6	45.6	42.6	48.5	45.8	39.8	48.8	45.6	43.9			
E300 (vol% off)	88.9	85.7	76.4	89.0	83.5	76.4	94.1	84.0	76.4	90.4	85.7	76.4	90.6	85.7	76.4	90.6	85.7	76.4			
T10 (2)	134	137	138	134	133	139	135	137	135	129	135	138	129	136	140	129	135	137			
T50 (3)	199	219	229	199	219	229	195	207	222	204	212	219	204	211	227	203	212	216			
T90 (4)	303	312	338	303	318	338	288	317	338	299	312	338	298	312	338	298	312	338			
Estimated DI	1100	1173	1233	1099	1174	1234	1075	1145	1207	1103	1149	1204	1105	1149	1229	1102	1150	1193			
En. Den. (MM Btu/bbl)	5.129	5.159	5.257	5.135	5.113	5.271	5.158	5.164	5.231	5.080	5.147	5.304	5.075	5.151	5.316	5.087	5.152	5.289			
Predictive Model % Emissions (5)																					
VOCs	-0.43			-0.36			-0.35			-0.40			-0.43			-0.49					
NOx	-0.33			-0.46			-1.89			-0.30			-0.30			-0.30					
Toxics	-0.64			-0.38			-8.11			-0.94			-1.53			-0.61					

(1) The RVP of ethanol blends is 1.3 psi higher than shown.

(2) Linear interpolations from ARMS generated distillation curves.

(3) Calculated using formula: T50 = (125.385 - E200)/0.377.

(4) Calculated using formula: T90 = (196.154 - E300)/0.354.

(5) % emissions for the Flat Limits Mode are calculated using the average gasoline properties, shown above, plus the average flat limit differentials estimated by CEC.

Exhibit 8: Modeling Results -- Gasoline Properties, by Case and Gasoline Type

Property & Predictive Model	Intermediate Term																				
	Averaging Mode																				
	Ethanol												TBA			ETBE			Mixed Oxygenates		
	RVPw			BasU			HR630			RVPw			USban			BasU			BasU		
% Emissions	3			4			5			6			1			1			1		
	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.
Property																					
RVP (psi) (1)		infeas		5.5	5.5	7.7		see 4			infeas		6.8	6.6	7.7	6.8	6.6	7.7	6.8	6.6	7.7
Oxygen (wt%)				2.7	2.7	0.2							2.2	2.7	1.8	2.1	2.7	0.5	2.1	2.7	0.8
Aromatics (vol%)				19.7	18.0	34.4							24.1	25.1	34.4	20.6	28.0	34.4	23.1	26.3	34.4
Benzene (vol%)				0.80	0.80	0.80							0.63	0.80	0.80	0.63	0.80	0.80	0.52	0.80	0.80
Olefins (vol%)				2.7	5.6	11.4							3.0	5.6	12.4	4.6	5.6	12.4	4.5	5.6	12.4
Sulfur (ppm)				25	38	44							16	38	126	25	38	153	18	38	153
E200 (vol% off)				48.8	44.0	40.2							50.7	45.5	38.9	50.4	46.0	38.9	50.4	44.8	38.9
E300 (vol% off)				90.7	88.4	76.4							88.4	83.5	76.4	89.1	85.7	76.4	88.8	85.7	76.4
T10 (2)				130	129	139							137	137	133	139	136	137	138	134	140
T50 (3)				203	216	226							198	212	229	199	211	229	199	214	229
T90 (4)				298	304	338							304	318	338	303	312	338	303	312	338
Estimated DI				1102	1147	1225							1104	1159	1226	1109	1148	1232	1108	1154	1237
En. Den. (MM Btu/bbl)				5.084	5.082	5.325							5.130	5.169	5.238	5.101	5.140	5.266	5.123	5.115	5.269
Predictive Model % Emissions (5)																					
VOCs				-0.39									-0.29			-0.48			-0.41		
NOx				-0.30									-1.02			-0.33			-0.34		
Toxics				-0.84									-0.36			-0.53			-0.54		

(1) The RVP of ethanol blends is 1.3 psi higher than shown.

(2) Linear interpolations from ARMS generated distillation curves.

(3) Calculated using formula: T50 = (125.385 - E200)/0.377.

(4) Calculated using formula: T90 = (196.154 - E300)/0.354.

(5) % emissions for the Flat Limits Mode are calculated using the average gasoline properties, shown above, plus the average flat limit differentials estimated by CEC.

Exhibit 8: Modeling Results -- Gasoline Properties, by Case and Gasoline Type

Property & Predictive Model	Intermediate Term																					
	Flat Limit Mode																					
	MTBE												No Oxygenate			Ethanol						
	Ref 2002		Conv FCC Feed Hydro			Deep FCC Feed Hydro			HR 630			HR 630			BasU Alk-100		HR630					
% Emissions	1	1c	1d	2	1	1	2	1	1	2	1	1	2	1	1	1	1	2	1	1		
	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	
Property																						
RVP (psi) (1)	6.8	6.6	7.7	6.8	6.6	7.7	6.8	6.6	7.7	6.8	6.6	7.7	6.8	6.6	7.7	5.5	6.6	7.7		see 1		
Oxygen (wt%)	2.1	2.1	0.3	2.1	2.1	0.3	2.1	2.1	0.3	1.5	2.1	0.3	0.0	2.7	2.0	2.7	2.7	2.7	1.0			
Aromatics (vol%)	24.0	22.6	34.4	23.6	28.0	34.4	24.5	20.3	34.4	25.2	20.3	34.4	20.4	28.0	34.4	20.4	25.7	34.4				
Benzene (vol%)	0.67	0.80	0.80	0.66	0.80	0.80	0.80	0.80	0.80	0.66	0.80	0.80	0.80	0.80	0.80	0.80	0.76	0.80				
Olefins (vol%)	4.3	5.6	12.4	4.3	5.6	12.4	2.8	5.6	6.9	4.4	5.6	12.4	5.0	5.6	12.4	2.9	5.6	12.2				
Sulfur (ppm)	24	38	153	26	38	153	18	38	101	21	38	153	25	38	98	25	30	76				
E200 (vol% off)	49.9	43.0	38.9	50.1	46.5	38.9	49.5	43.0	38.9	49.8	43.0	38.9	50.4	47.4	40.4	47.8	45.6	43.7				
E300 (vol% off)	87.5	85.7	76.4	86.7	85.7	76.4	87.5	83.5	76.4	88.2	83.5	76.4	91.7	83.8	76.4	89.8	83.5	76.4				
T10 (2)	134	137	139	133	138	138	134	136	142	134	133	138	137	137	133	130	133	136				
T50 (3)	200	219	229	200	209	229	201	219	229	201	219	229	199	207	225	206	212	217				
T90 (4)	307	312	338	309	312	338	307	318	338	305	318	338	295	317	338	300	318	338				
Estimated DI	1108	1173	1234	1108	1147	1233	1111	1178	1239	1108	1174	1234	1097	1143	1213	1113	1154	1193				
En. Den. (MM Btu/bbl)	5.134	5.155	5.285	5.131	5.194	5.280	5.129	5.151	5.306	5.154	5.123	5.282	5.178	5.164	5.227	5.092	5.139	5.292				
Predictive Model % Emissions (5)																						
VOCs	-0.75			-0.46			-0.59			-0.55			-0.53			-0.61						
NOx	-0.53			-0.56			-1.39			-0.58			-0.83			-0.54						
Toxics	-0.64			-0.64			-0.57			-0.63			-4.85			-2.85						

(1) The RVP of ethanol blends is 1.3 psi higher than shown.

(2) Linear interpolations from ARMS generated distillation curves.

(3) Calculated using formula: T50 = (125.385 - E200)/0.377.

(4) Calculated using formula: T90 = (196.154 - E300)/0.354.

(5) % emissions for the Flat Limits Mode are calculated using the average gasoline properties, shown above, plus the average flat limit differentials estimated by CEC.

Exhibit 8: Modeling Results -- Gasoline Properties, by Case and Gasoline Type

Property & Predictive Model % Emissions	Intermediate Term																	
	Flat Limit Mode																	
	Ethanol									TBA			ETBE			Mixed Oxygenates		
	RVPw 3			RVPw Conv Hyd 3c			RVPw Deep Hyd 3d			BasU 1			BasU 1			BasU 1		
CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	
Property																		
RVP (psi) (1)	6.5	6.7	7.7	6.5	6.7	7.7	6.5	6.6	7.7	6.8	6.6	7.7	6.8	6.6	7.7	6.8	6.6	7.7
Oxygen (wt%)	3.5	2.7	1.1	3.5	2.7	1.5	3.5	2.7	1.4	2.1	2.7	1.9	2.1	2.7	0.5	2.1	2.7	0.8
Aromatics (vol%)	23.0	28.0	27.9	23.1	28.0	34.4	21.1	28.0	27.1	25.4	25.6	34.4	21.2	28.0	34.4	25.5	23.4	34.4
Benzene (vol%)	0.80	0.80	0.80	0.80	0.80	0.80	0.64	0.80	0.67	0.62	0.80	0.80	0.80	0.80	0.57	0.80	0.80	0.80
Olefins (vol%)	0.8	5.6	12.4	0.6	5.6	12.4	0.9	5.6	10.0	4.1	5.6	12.4	4.3	5.6	12.4	4.1	5.6	12.4
Sulfur (ppm)	9	38	93	12	38	153	10	36	45	23	38	124	33	38	153	17	38	153
E200 (vol% off)	49.6	47.5	39.8	50.6	47.0	38.9	50.0	46.9	41.6	50.1	45.9	39.6	49.7	45.3	38.9	49.5	43.0	38.9
E300 (vol% off)	84.8	89.2	77.0	83.9	92.0	91.3	83.7	84.3	76.4	87.2	83.5	76.4	87.8	87.5	76.4	86.4	85.7	76.4
T10 (2)	124	138	138	123	136	136	123	136	137	137	137	133	139	137	141	138	135	138
T50 (3)	201	207	227	198	208	229	200	208	222	200	211	228	201	212	229	201	219	229
T90 (4)	315	302	337	317	294	296	318	316	338	308	318	338	306	307	338	310	312	338
Estimated DI	1103	1129	1224	1097	1123	1189	1103	1145	1210	1113	1156	1220	1117	1149	1238	1120	1169	1233
En. Den. (MM Btu/bbl)	5.046	5.180	5.251	5.055	5.162	5.212	5.036	5.163	5.237	5.145	5.154	5.235	5.103	5.150	5.285	5.145	5.139	5.267
Predictive Model % Emissions (5)																		
VOCs	-0.57			-0.50			-0.57			-0.66			-0.54			-0.47		
NOx	-0.47			-0.52			-0.52			-0.52			-0.53			-0.72		
Toxics	-2.13			-2.17			-5.07			-0.49			-0.58			-0.54		

(1) The RVP of ethanol blends is 1.3 psi higher than shown.

(2) Linear interpolations from ARMS generated distillation curves.

(3) Calculated using formula: T50 = (125.385 - E200)/0.377.

(4) Calculated using formula: T90 = (196.154 - E300)/0.354.

(5) % emissions for the Flat Limits Mode are calculated using the average gasoline properties, shown above, plus the average flat limit differentials estimated by CEC.

Exhibit 8: Modeling Results -- Gasoline Properties, by Case and Gasoline Type

Property & Predictive Model	Long Term Averaging Mode																				
	MTBE						No Oxygenate			Ethanol											
	Ref 2005		HR 630		HR630			BasU Alk-100		BasU Alk-175			BasU Alk-50		HR630						
	1	2	1	2	1	2	1	1a	1b	1c	2	1	2	1c	2	1	2	1	2	1	
% Emissions	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.
Property																					
RVP (psi) (1)	6.8	6.6	7.7	6.8	6.6	7.7	6.8	6.6	7.7	5.5	6.6	7.7	5.5	6.6	7.7	5.5	6.6	7.7	see 1a		
Oxygen (wt%)	2.1	2.1	0.3	1.8	2.7	0.3	0.0	2.7	2.0	2.7	2.7	1.4	2.7	2.7	1.5	2.7	2.7	2.7	1.3		
Aromatics (vol%)	23.2	22.6	34.4	23.7	21.1	34.4	22.1	28.0	34.4	20.9	28.0	34.4	19.9	27.9	34.4	22.5	25.6	34.4			
Benzene (vol%)	0.52	0.80	0.80	0.53	0.80	0.80	0.80	0.80	0.80	0.73	0.80	0.80	0.77	0.80	0.80	0.62	0.80	0.80			
Olefins (vol%)	4.5	5.6	12.4	4.4	5.6	12.4	5.7	5.6	12.4	2.8	5.6	12.4	3.0	5.6	12.4	3.0	5.6	12.4			
Sulfur (ppm)	18	38	153	17	38	153	15	30	149	22	30	66	22	32	75	16	30	140			
E200 (vol% off)	50.4	43.0	38.9	50.3	43.0	38.9	53.7	44.7	38.9	49.3	45.7	41.1	48.8	45.6	40.6	49.0	45.5	43.7			
E300 (vol% off)	88.9	85.7	76.4	89.2	83.5	76.4	90.7	88.4	76.4	89.3	85.6	76.4	89.9	85.7	76.4	89.2	83.5	76.4			
T10 (2)	134	136	138	134	134	138	137	138	134	131	135	136	131	136	135	131	133	137			
T50 (3)	199	219	229	199	219	229	190	214	229	202	211	224	203	212	225	203	212	217			
T90 (4)	303	312	338	302	318	338	298	304	338	302	312	338	300	312	338	302	318	338			
Estimated DI	1100	1172	1233	1101	1175	1233	1074	1154	1227	1104	1149	1213	1106	1151	1216	1106	1154	1194			
En. Den. (MM Btu/bbl)	5.130	5.157	5.255	5.137	5.126	5.252	5.183	5.150	5.213	5.095	5.147	5.273	5.090	5.153	5.263	5.106	5.138	5.254			
Predictive Model % Emissions (5)																					
VOCs	-0.44			-0.43			-0.31			-0.47			-0.45			-0.36					
NOx	-0.31			-0.32			-0.33			-0.32			-0.28			-0.29					
Toxics	-0.50			-0.30			-0.88			-0.42			-0.41			-0.52					

(1) The RVP of ethanol blends is 1.3 psi higher than shown.

(2) Linear interpolations from ARMS generated distillation curves.

(3) Calculated using formula: T50 = (125.385 - E200)/0.377.

(4) Calculated using formula: T90 = (196.154 - E300)/0.354.

(5) % emissions for the Flat Limits Mode are calculated using the average gasoline properties, shown above, plus the average flat limit differentials estimated by CEC.

Exhibit 8: Modeling Results -- Gasoline Properties, by Case and Gasoline Type

Property & Predictive Model	Long Term																				
	Averaging Mode																				
	Ethanol																				
	RVPw			BasU			HR630			RVPw			USban			TBA			ETBE		
% Emissions	3			4			5			6			1			1			1		
	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.
Property																					
RVP (psi) (1)		infeas		5.5	5.5	7.7		see 4			infeas		6.8	6.6	7.7	6.8	6.6	7.7	6.8	6.6	7.7
Oxygen (wt%)				2.7	2.7	0.2							2.2	2.7	2.1	2.1	2.7	0.4	2.1	2.7	0.8
Aromatics (vol%)				23.8	18.0	34.4							23.9	25.9	34.4	20.8	26.9	34.4	22.1	24.6	34.4
Benzene (vol%)				0.57	0.80	0.80							0.53	0.80	0.80	0.62	0.80	0.80	0.56	0.80	0.80
Olefins (vol%)				2.8	5.6	12.4							4.1	5.6	12.4	4.6	5.6	12.4	4.6	5.6	12.4
Sulfur (ppm)				16	38	101							22	38	119	25	38	153	20	38	153
E200 (vol% off)				49.5	44.8	39.9							51.0	46.1	40.3	50.4	45.2	38.9	50.3	43.7	38.9
E300 (vol% off)				88.5	85.7	76.4							88.6	83.5	76.4	89.0	85.7	76.4	89.0	85.7	76.4
T10 (2)				131	133	141							137	137	132	139	137	137	139	136	140
T50 (3)				201	214	227							197	210	226	199	213	229	199	217	229
T90 (4)				304	312	338							304	318	338	303	312	338	303	312	338
Estimated DI				1104	1153	1229							1101	1154	1213	1108	1155	1232	1108	1166	1236
En. Den. (MM Btu/bbl)				5.110	5.101	5.312							5.131	5.158	5.225	5.101	5.140	5.271	5.109	5.145	5.273
Predictive Model % Emissions (5)																					
VOCs				-0.31									-0.35			-0.41			-0.45		
NOx				-0.32									-0.29			-0.32			-0.33		
Toxics				-0.37									-0.34			-0.45			-0.52		

(1) The RVP of ethanol blends is 1.3 psi higher than shown.

(2) Linear interpolations from ARMS generated distillation curves.

(3) Calculated using formula: T50 = (125.385 - E200)/0.377.

(4) Calculated using formula: T90 = (196.154 - E300)/0.354.

(5) % emissions for the Flat Limits Mode are calculated using the average gasoline properties, shown above, plus the average flat limit differentials estimated by CEC.

Exhibit 8: Modeling Results -- Gasoline Properties, by Case and Gasoline Type

Property & Predictive Model	Long Term																				
	Flat Limit Mode																				
	MTBE												No Oxygenate			Ethanol					
	Ref 2005		Conv FCC Feed Hydro			Deep FCC Feed Hydro			HR 630			HR 630			BasU Alk-100		HR630				
% Emissions	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.
Property																					
RVP (psi) (1)	6.8	6.6	7.7	6.8	6.6	7.7	6.8	6.7	7.7	6.8	6.6	7.7	6.8	6.6	7.7	5.5	6.6	7.7		see 1	
Oxygen (wt%)	2.1	2.1	0.3	2.1	2.1	0.3	2.1	2.1	0.3	1.6	2.7	0.3	0.0	2.7	2.6	2.7	2.7	2.7	1.0		
Aromatics (vol%)	24.1	22.6	34.4	23.2	28.0	34.4	24.5	18.0	34.4	24.5	23.4	34.4	25.8	21.7	31.8	22.3	25.6	34.4			
Benzene (vol%)	0.66	0.80	0.80	0.67	0.80	0.80	0.80	0.80	0.80	0.65	0.80	0.80	0.73	0.80	0.80	0.80	0.80	0.80	0.80		
Olefins (vol%)	4.3	5.6	12.4	4.4	5.6	12.4	2.8	5.6	7.1	4.7	5.6	12.4	5.1	5.6	12.4	2.9	5.6	12.4			
Sulfur (ppm)	23	38	153	26	38	153	17	38	123	19	38	153	17	30	150	22	30	88			
E200 (vol% off)	49.8	43.0	38.9	50.0	45.6	38.9	49.4	43.0	38.9	49.3	43.0	38.9	50.9	43.0	38.9	48.2	45.5	40.3			
E300 (vol% off)	87.3	85.7	76.4	86.9	88.4	76.4	87.7	83.5	76.4	88.4	85.7	76.4	88.6	83.5	76.4	89.0	83.5	76.4			
T10 (2)	134	138	139	132	138	138	133	138	142	134	133	138	138	134	132	131	135	137			
T50 (3)	201	219	229	200	212	229	201	219	229	202	219	229	197	219	229	205	212	226			
T90 (4)	308	312	338	309	304	338	306	318	338	305	312	338	304	318	338	303	318	338			
Estimated DI	1109	1175	1235	1107	1146	1233	1111	1181	1239	1111	1167	1233	1103	1175	1225	1114	1155	1221			
En. Den. (MM Btu/bbl)	5.134	5.161	5.286	5.127	5.165	5.268	5.128	5.157	5.307	5.151	5.128	5.258	5.212	5.148	5.178	5.101	5.146	5.295			
Predictive Model % Emissions (5)																					
VOCs	-0.62			-0.55			-0.45			-0.57			-0.53			-0.53					
NOx	-0.56			-0.54			-1.39			-0.54			-0.54			-0.53					
Toxics	-0.58			-0.73			-0.58			-0.72			-0.55			-1.30					

(1) The RVP of ethanol blends is 1.3 psi higher than shown.

(2) Linear interpolations from ARMS generated distillation curves.

(3) Calculated using formula: T50 = (125.385 - E200)/0.377.

(4) Calculated using formula: T90 = (196.154 - E300)/0.354.

(5) % emissions for the Flat Limits Mode are calculated using the average gasoline properties, shown above, plus the average flat limit differentials estimated by CEC.

Exhibit 8: Modeling Results -- Gasoline Properties, by Case and Gasoline Type

Property & Predictive Model % Emissions	Long Term																	
	Flat Limit Mode																	
	Ethanol									TBA			ETBE			Mixed Oxygenates		
	RVPw 3			RVPw Conv Hyd 3c			RVPw Deep Hyd 3d			BasU 1			BasU 1			BasU 1		
	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.
Property																		
RVP (psi) (1)	6.5	6.7	7.7	6.5	6.7	7.7	6.5	6.6	7.7	6.8	6.6	7.7	6.8	6.6	7.7	6.8	6.6	7.7
Oxygen (wt%)	3.5	2.7	1.2	3.5	2.7	1.0	3.5	2.7	1.2	2.1	2.7	1.9	2.1	2.7	0.4	2.1	2.7	0.4
Aromatics (vol%)	23.1	28.0	26.4	22.6	28.0	34.4	23.8	26.3	25.1	25.3	25.9	34.4	21.2	28.0	34.4	23.1	23.4	34.4
Benzene (vol%)	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.63	0.80	0.80	0.78	0.80	0.80	0.69	0.80	0.80
Olefins (vol%)	0.7	5.6	12.4	0.7	5.6	12.4	0.7	5.6	11.0	4.1	5.6	12.4	4.4	5.6	12.4	4.5	5.6	12.4
Sulfur (ppm)	9	32	55	12	38	153	8	38	42	22	38	124	32	38	153	24	38	153
E200 (vol% off)	49.7	46.5	41.7	50.5	48.8	38.9	50.2	46.1	44.3	50.0	46.1	39.6	49.6	46.0	38.9	49.6	43.0	38.9
E300 (vol% off)	84.9	88.9	79.1	83.9	92.0	89.9	84.3	83.9	79.5	87.3	83.5	76.4	87.8	85.7	76.4	87.5	85.7	76.4
T10 (2)	125	138	137	124	139	141	124	139	138	137	137	133	139	136	138	139	137	138
T50 (3)	201	209	222	199	203	229	199	210	215	200	210	228	201	211	229	201	219	229
T90 (4)	314	303	331	317	294	300	316	317	330	308	318	338	306	312	338	307	312	338
Estimated DI	1103	1137	1203	1099	1112	1200	1100	1156	1181	1114	1154	1220	1118	1148	1234	1118	1173	1234
En. Den. (MM Btu/bbl)	5.049	5.176	5.241	5.050	5.176	5.254	5.055	5.199	5.240	5.144	5.158	5.236	5.105	5.148	5.278	5.120	5.150	5.275
Predictive Model % Emissions (5)																		
VOCs	-0.70			-0.58			-0.63			-0.70			-0.53			-0.64		
NOx	-0.50			-0.49			-0.55			-0.56			-0.51			-0.53		
Toxics	-2.29			-2.45			-1.77			-0.49			-0.70			-0.62		

(1) The RVP of ethanol blends is 1.3 psi higher than shown.

(2) Linear interpolations from ARMS generated distillation curves.

(3) Calculated using formula: T50 = (125.385 - E200)/0.377.

(4) Calculated using formula: T90 = (196.154 - E300)/0.354.

(5) % emissions for the Flat Limits Mode are calculated using the average gasoline properties, shown above, plus the average flat limit differentials estimated by CEC.

Exhibit 8: Modeling Results -- Gasoline Properties, by Case and Gasoline Type
Supplement

Property & Predictive Model	Intermediate Term												Long Term													
	Recipe (6)			Averaging Mode			Flat Limit Mode			Recipe (6)			Ethanol			Ethanol			Averaging Mode			No Oxygen				
	Ethanol			No Oxygen			No Oxygen			Ethanol			Ethanol			No Oxygen			No Oxygen			No Oxygen				
	RVPw			HR 630			HR 630			RVPw			BasU			HR 630			HR 630			Alk-zero				
	7			2			USban			2			7			8			2			3				
% Emissions	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.		
Property																										
RVP (psi) (1)	6.5	6.7	7.7	6.8	5.5	7.7	6.8	5.5	7.7	6.5	6.7	7.7	5.5	6.6	7.7	6.8	5.5	7.7	6.8	6.6	7.7					
Oxygen (wt%)	3.5	2.7	2.4	0.0	2.7	0.0	0.0	2.7	0.0	3.5	2.7	2.7	2.7	2.7	2.5	0.0	2.7	0.0	0.0	2.7	1.8					
Aromatics (vol%)	21.3	24.8	28.6	18.2	18.0	34.4	21.9	18.0	34.4	22.2	25.7	26.6	23.7	25.5	26.1	24.5	18.0	34.4	25.0	28.0	33.8					
Benzene (vol%)	0.85	0.80	0.80	0.80	0.80	0.66	0.80	0.80	0.80	0.85	0.80	0.80	0.59	0.80	0.80	0.79	0.80	0.80	0.68	0.80	0.80					
Olefins (vol%)	4.2	5.6	12.4	3.5	5.6	12.4	5.1	5.6	12.4	4.2	5.6	12.4	2.8	5.6	12.4	5.1	5.6	12.4	5.2	5.6	12.4					
Sulfur (ppm)	31	38	79	15	38	62	23	38	116	33	30	153	15	30	138	13	38	150	14	31	153					
E200 (vol% off)	52.0	48.4	43.4	52.7	43.9	40.2	50.7	44.0	38.9	50.5	50.2	53.0	49.1	45.4	49.0	54.4	44.0	38.9	54.9	45.8	40.1					
E300 (vol% off)	91.8	83.5	76.4	94.6	89.8	80.7	91.4	88.4	76.4	91.8	83.5	76.4	89.2	83.5	76.4	90.2	88.4	76.4	88.1	85.4	76.4					
T10 (2)	126	136	133	135	130	141	137	131	136	127	134	132	131	134	133	137	133	141	137	136	134					
T50 (3)	195	204	217	193	216	226	198	216	229	199	199	192	202	212	203	188	216	229	187	211	226					
T90 (4)	295	318	338	287	301	326	296	304	338	295	318	338	302	318	338	299	304	338	305	313	338					
Estimated DI	1068	1135	1190	1068	1145	1215	1096	1149	1231	1081	1118	1112	1105	1155	1146	1069	1152	1237	1072	1150	1217					
En. Den. (MM Btu/bbl)	5.048	5.142	5.194	5.156	5.093	5.307	5.189	5.072	5.295	5.054	5.133	5.133	5.108	5.139	5.182	5.192	5.109	5.297	5.203	5.160	5.229					
Predictive Model % Emissions (5)	Avg.	Flat								Avg.	Flat															
VOCs	-8.29	-2.12		-0.30			-0.73			-7.09	-2.12		-0.30			-0.32			-0.29							
NOx	1.48	2.62		-1.73			-0.66			1.56	2.62		-0.27			-0.37			-0.39							
Toxics	-10.57	1.34		-8.07			-3.73			-8.98	1.34		-0.33			-0.22			-0.25							

(1) The RVP of ethanol blends is 1.3 psi higher than shown.

(2) Linear interpolations from ARMS generated distillation curves.

(3) Calculated using formula: T50 = (125.385 - E200)/0.377.

(4) Calculated using formula: T90 = (196.154 - E300)/0.354.

(5) % emissions for the Flat Limits Mode are calculated using the average gasoline properties, shown above, plus the average flat limit differentials estimated by CEC.

(6) % emissions for CARB gasoline are calculated using average gasoline properties, shown above, and the recipe flat limits with 3.5 wt% oxygen.

Exhibit 8: Modeling Results -- Gasoline Properties, by Case and Gasoline Type
Supplement

Property & Predictive Model	Long Term											
	Flat Limit Mode											
	Ethanol						No Oxygen					
	BasU USban 4			BasU Alk-zero 8			HR 630 USban 2			HR 630 Alk-zero 3		
% Emissions	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.	CARB	Ariz.	Conv.
Property												
RVP (psi) (1)	5.5	5.5	7.7	5.5	6.6	7.7	6.8	5.5	7.7	6.8	6.6	7.7
Oxygen (wt%)	2.7	2.7	0.2	2.7	2.7	2.7	0.0	2.7	0.0	0.0	2.7	2.7
Aromatics (vol%)	23.9	18.0	34.4	24.2	25.5	25.5	26.1	18.0	34.4	26.1	28.0	31.1
Benzene (vol%)	0.77	0.80	0.80	0.76	0.80	0.80	0.69	0.80	0.80	0.70	0.80	0.80
Olefins (vol%)	2.7	5.6	12.4	2.7	5.6	12.4	5.1	5.6	12.4	5.1	5.6	12.4
Sulfur (ppm)	22	38	61	21	30	110	15	38	141	16	38	134
E200 (vol% off)	48.7	44.8	38.9	48.6	45.5	49.6	50.9	44.8	38.9	50.9	47.6	43.0
E300 (vol% off)	88.4	85.7	76.4	88.4	83.5	76.4	88.4	85.7	76.4	88.4	83.5	76.4
T10 (2)	131	129	140	131	134	132	138	133	137	138	138	132
T50 (3)	203	214	229	204	212	201	198	214	229	198	206	218
T90 (4)	305	312	338	304	318	338	304	312	338	304	318	338
Estimated DI	1111	1147	1237	1112	1155	1140	1104	1153	1232	1104	1144	1192
En. Den. (MM Btu/bbl)	5.111	5.053	5.325	5.112	5.140	5.181	5.209	5.118	5.279	5.210	5.186	5.175
Predictive Model % Emissions (5)												
VOCs	-0.56			-0.48			-0.60			-0.53		
NOx	-0.53			-0.54			-0.58			-0.55		
Toxics	-0.71			-0.60			-0.87			-0.67		

(1) The RVP of ethanol blends is 1.3 psi higher than shown.

(2) Linear interpolations from ARMS generated distillation curves.

(3) Calculated using formula: T50 = (125.385 - E200)/0.377.

(4) Calculated using formula: T90 = (196.154 - E300)/0.354.

(5) % emissions for the Flat Limits Mode are calculated using the average gasoline properties, shown above, plus the average flat limit differentials estimated by t

Exhibit 9: Modeling Results -- Gasoline Composition and Volume, by Type and Case

Gasoline Composition & Volume	Intermediate Term																												
	Averaging Mode																												
	MTBE								No Oxygenate						Ethanol														
	Ref 2002				HR 630				HR630						BasU				BasU				BasU						
	1		2		1		1		Alk-100				1a		Alk-175				1b				Alk-50						
	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	
Composition (vol%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0			
C4s:	0.6	1.4	3.4	1.0	0.5	0.5	2.9	0.8	0.5	0.5	1.4	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	see 1a	
Butenes																													
I-Butane																													
N-Butane	0.6	1.4	3.4	1.0	0.5	0.5	2.9	0.8	0.5	0.5	1.4	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		
C5s & Isomerate	4.7	0.2	13.4	5.6	7.9	3.0	13.6	8.4	11.8		1.6	9.3	6.3	8.6	0.9	5.7	5.4	5.0	1.6	4.9	6.0	6.4	0.9	5.2					
Raffinate																													
Natural Gas Liquids																													
Naphtha	2.4	0.0	5.1	2.6	0.1	0.5	6.5	1.0	0.2	6.0	0.0	0.6	7.2	1.4	0.7	6.0	8.1	0.0	0.0	6.6	6.7	3.1	0.4	5.5					
C5-160	2.4		5.1	2.6	0.1	0.5	6.5	1.0	0.2	6.0		0.6	1.8	1.4	0.7	1.6	3.0			2.4	0.5	3.1	0.4	0.7					
Coker Naphtha																													
160-250													5.5			4.4	5.1			4.2	6.2			4.8					
Alkylate	15.6	15.9	0.0	13.8	16.0	16.7	0.0	14.0	37.9	0.0	0.0	29.1	30.2	0.0	0.0	24.3	31.9	1.3	0.0	26.2	28.2	0.7	0.0	22.2					
Hydrocrackate	18.8			15.6	17.2	13.5		14.8	10.6	6.4	2.0	8.9	12.2	15.1			10.7	13.4	11.7		11.6	11.6	15.0	0.6	10.2				
Dimate																													
Poly Gasoline	0.1	0.4		0.1					0.1			0.1	0.1			0.1					0.1			0.1					
FCC Gasoline:	24.4	58.1	52.1	29.1	26.9	34.7	45.1	29.6	25.3	55.8	66.0	34.0	19.4	39.0	73.9	27.9	17.1	48.3	69.8	25.5	21.5	40.0	76.8	31.1					
Full Range	19.7		18.3	18.6	19.6		20.7	18.7	16.4	48.5	29.7	20.8	7.9	37.6	65.6	17.4	6.8	47.5	62.0	16.1	8.9	40.0	63.6	19.2					
Light	2.1			1.7	2.1	15.7	0.1	2.6	1.1		9.9	2.4			8.3	1.1			7.9	1.0			9.0	1.4					
Light - Desulf.	0.2	14.1																											
Medium	0.8	4.2	20.4	3.5	0.8	6.0	18.5	3.3			12.6	2.0	3.6	1.4		3.0	4.6	0.7		3.8	2.7			2.1					
Medium - Desulf.	1.6	26.6		2.8	3.4			2.8	7.9	5.9		6.5	5.5			4.4	3.4			2.8	7.9			6.2					
Heavy																							4.2	0.6					
Heavy - Desulf.	0.1	13.1	13.4	2.5	1.0	13.1	5.9	2.3		1.5	13.8	2.3	2.4			2.0	2.2			1.8	2.0			1.6					
Reformate	21.7	12.1	24.3	21.7	21.4	16.2	30.2	22.2	13.5	16.0	22.2	15.1	16.3	20.1	19.2	16.9	15.9	18.1	25.5	17.2	17.6	19.1	15.1	17.3					
Light	7.9	12.1	17.9	9.5	10.5	7.8	8.0	10.0	13.5	16.0	22.1	15.1	7.0	6.1	10.6	7.4	6.6	18.1	9.4	7.6	8.1	6.3	15.1	9.0					
Medium																													
Heavy	13.8		6.4	12.3	10.9	8.3	22.2	12.2		0.1	0.0	9.3	14.1	8.5	9.5	9.3		16.1	9.6	9.6	12.8		8.3						
Oxygenate	11.5	11.9	1.6	10.4	9.9	15.0	1.6	9.1	0.0	15.2	6.8	2.2	7.8	15.2	4.7	7.8	7.8	15.2	2.7	7.5	7.8	15.2	5.7	7.9					
MTBE	11.5	9.3	1.6	10.3	9.8	13.5	1.6	9.0		12.6	6.8	2.0		12.6	4.7	1.4		12.6	2.7	1.0		12.6	5.7	1.7					
Ethanol													7.8		6.3	7.8			6.4	7.8			6.1						
TBA																													
ETBE																													
TAME		2.6		0.1	0.1	1.5		0.1		2.6		0.2		2.6		0.2		2.6		0.1		2.6		0.2					
DIPE																													
Volume (K Bbl/day)	965	64	150	1,168	965	64	150	1,179	710	64	150	924	895	64	150	1,109	965	64	150	1,179	775	64	150	989					

Exhibit 9: Modeling Results -- Gasoline Composition and Volume, by Type and Case

Gasoline Composition & Volume	Intermediate Term																												
	Averaging Mode																												
	Ethanol								TBA								ETBE				Mixed Oxygenates								
	RVPw				BasU				HR630				RVPw				BasU				BasU								
	3				USban				5				USban				6				1								
	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool					
Composition (vol%)			infeas		100.0	100.0	100.0	100.0			see 4						100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0					
C4s:					0.5	0.5	0.5	0.5									0.5	0.5	1.8	0.7	1.9	0.5	3.4	2.0	0.8	1.5	3.9	1.3	
Butenes																													
I-Butane																													
N-Butane					0.5	0.5	0.5	0.5									0.5	0.5	1.8	0.7	1.9	0.5	3.4	2.0	0.8	1.5	3.9	1.3	
C5s & Isomerate					4.6	9.0	5.9	5.1									8.7		1.6	7.4	4.4	4.8	9.3	5.1	6.8			5.6	
Raffinate																													
Natural Gas Liquids																													
Naphtha					7.6	4.8	0.0	6.3									0.6	7.3	0.0	0.9	4.3	1.0	7.3	4.5	1.5	0.0	10.6	2.6	
C5-160					2.0			1.6									0.6	7.3		0.9	2.3	1.0	4.8	2.6	1.5		10.6	2.6	
Coker Naphtha																													
160-250					5.6	4.8		4.7													2.0		2.5	2.0					
Alkylate					29.6	28.1	1.2	25.2									19.4	7.2	0.0	16.5	15.1	4.9	1.5	12.9	16.2	5.9	0.0	13.7	
Hydrocrackate					11.3	7.9		9.4									11.6	11.0	10.1	11.5	18.6	16.6		16.3	15.0	28.8	6.0	14.7	
Dimate																													
Poly Gasoline							0.7	0.1																	0.0	1.5		0.1	
FCC Gasoline:					21.9	33.7	67.9	29.6									26.3	42.4	41.3	28.2	25.1	32.1	48.1	28.0	27.2	22.9	46.7	28.9	
Full Range					9.5	22.5	60.7	18.1									16.9	36.9	29.7	19.9	18.6		23.8	18.4	19.5		19.9	18.6	
Light							7.2	1.1									0.5		2.7	0.8	1.5	3.7		1.5	2.1			1.7	
Light - Desulf.																		4.9	8.0		0.2	8.1			0.8	2.8			
Medium					2.8	6.5		2.6									0.6	0.7	0.1	3.2	5.2	14.5	4.8	0.8	9.8	18.9	3.7		
Medium - Desulf.					7.2			5.6									6.7			5.5	1.0			0.8	3.0			2.5	
Heavy																		0.1	0.0										
Heavy - Desulf.					2.4	4.7		2.2									2.2			1.8	0.5	15.1	9.9	2.5	1.0	10.2	7.8	2.4	
Reformate						16.6	8.3	22.8	17.0								22.7	16.3	35.3	24.3	17.2	24.9	27.8	19.1	20.7	24.6	28.6	22.1	
Light						10.0	8.3	5.0	9.2								13.6	2.4		11.4	4.8	24.9	14.7	7.2	9.5	13.6	9.7	9.8	
Medium																													
Heavy						6.6		17.8	7.9								9.2	13.9	35.3	12.9	12.4		13.1	11.9	11.2	11.0	18.9	12.3	
Oxygenate						7.8	7.8	1.1	6.8								10.2	15.2	9.9	10.6	13.4	15.2	2.6	12.2	11.6	14.8	4.3	11.0	
MTBE																		12.6	9.9	2.0		12.6	2.6	1.0		14.8	4.3	1.4	
Ethanol						7.8	7.8		6.6																				
TBA																	10.2			8.4					4.6			3.8	
ETBE																				13.4			11.0	6.8			5.7		
TAME								1.1	0.2									2.6		0.1		2.6		0.1	0.2		0.1		
DIPE																													
Volume (K Bbl/day)					780	64	150	994									965	64	150	1,164	965	64	150	1,172	965	64	150	1,169	

Exhibit 9: Modeling Results -- Gasoline Composition and Volume, by Type and Case

Gasoline Composition & Volume	Intermediate Term																													
	Flat Limit Mode																													
	MTBE												No Oxygenate						Ethanol											
	Ref 2002				Conv FCC Feed Hydro				Deep FCC Feed Hydro				HR 630				HR 630				BasU				Alk-100					
	1				1c				1d				2				1				1				HR630					
	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool		
Composition (vol%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	see 1			
C4s:	0.6	2.7	3.7	1.2	0.6	1.8	3.4	1.1	0.6	1.2	3.5	1.0	0.5	0.5	1.9	0.7	0.5	0.5	1.3	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5			
Butenes																														
I-Butane																														
N-Butane	0.6	2.7	3.7	1.2	0.6	1.8	3.4	1.1	0.6	1.2	3.5	1.0	0.5	0.5	1.9	0.7	0.1	0.5	1.3	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5			
C5s & Isomerate	6.1	9.9		5.6	6.3		3.6	5.8	7.7	0.3		6.3	8.5	14.8	9.1	8.9	11.3		1.6	9.2	4.3	10.8	4.3	4.7						
Raffinate																														
Natural Gas Liquids																														
Naphtha	2.4	0.0	4.9	2.6	2.4	0.4	4.9	2.6	2.1	2.6	6.4	2.6	0.5	0.0	5.0	1.1	0.7	4.3	0.0	0.8	8.2	0.0	0.0	6.7						
C5-160	2.4		4.9	2.6	2.4	0.4	4.9	2.6	2.1	2.6	4.8	2.4	0.5		5.0	1.1	0.7	4.3		0.8	2.9			2.4						
Coker Naphtha																														
160-250																													5.2	4.3
Alkylate	14.4	13.9	5.7	13.3	14.8	13.0	3.8	13.7	12.8	16.9	7.4	12.3	15.7	18.0	3.3	14.3	32.5	0.0	0.0	25.8	28.4	1.4	0.0	23.4						
Hydrocrackate	17.0	2.5	8.1	15.1	14.9	8.9	6.2	13.9	18.5	12.0		15.8	15.6	13.0	0.4	13.5	9.2	3.9	12.1	9.3	12.8	13.8	1.1	11.4						
Dimate																														
Poly Gasoline	0.1			0.1																	0.1		0.1		0.1					
FCC Gasoline:	27.0	42.7	46.8	30.4	26.2	40.0	46.4	27.6	23.5	49.1	56.3	29.1	28.0	26.0	45.6	30.1	28.9	60.5	40.3	32.5	19.0	42.2	71.4	26.9						
Full Range	20.0		24.8	19.6			24.6	3.2	23.5	49.1	56.3	29.1	19.8		26.9	19.7	17.5	43.5	22.9	19.9	8.2	42.0	63.2	17.0						
Light	2.2	6.7		2.2	3.5	3.0		3.1					1.6	9.2	4.4	2.4	0.9	2.2	14.0	2.9				8.2	1.0					
Light - Desulf.																														
Medium	1.7	6.8	13.6	3.5	4.2	5.7	14.6	5.8					1.5	7.6	10.0	2.9	2.9		0.6	2.4	3.6			2.9						
Medium - Desulf.	1.2	23.1		2.3	9.0	8.3		8.0					3.6			3.0	5.6	12.3		5.2	4.9			4.0						
Heavy																														
Heavy - Desulf.	1.8	6.1	8.4	2.9	6.8	14.5	7.3	7.5					1.4	9.2	4.3	2.2	1.9	2.6		1.7	2.2	0.2		1.8						
Reformate	20.7	16.8	29.1	21.6	23.2	24.1	30.0	24.8	23.2	6.1	24.7	22.5	23.0	16.2	33.0	23.9	16.7	15.6	33.9	19.1	19.0	16.0	17.4	18.6						
Light	9.5		13.7	9.5	8.1	24.1	11.8	9.7	9.4	5.9	14.2	9.9	11.7		10.6	11.0	16.7	15.6		14.3	7.8		8.5	7.5						
Medium																														
Heavy	11.2	16.8	15.3	12.1	15.1		18.2	15.1	13.8	0.2	10.5	12.6	11.3	16.2	22.4	12.9			33.9	4.9	11.1	16.0	8.9	11.1						
Oxygenate	11.6	11.5	1.6	10.3	11.5	11.9	1.6	10.6	11.5	11.9	1.6	10.3	8.1	11.5	1.6	7.5	0.0	15.2	10.8	2.5	7.8	15.2	5.3	7.9						
MTBE	11.4	11.5	1.6	10.2	11.5	9.3	1.6	10.4	11.5	9.3	1.6	10.2	8.0	11.5	1.6	7.3		12.6	10.8	2.3		12.6	5.3	1.4						
Ethanol																														
TBA																														
ETBE																														
TAME	0.2			0.1		2.6		0.1		2.6		0.1	0.2			0.1		2.6		0.2		2.6		0.1						
DIPE																														
Volume (K Bbl/day)	965	64	150	1,179	965	64	150	1,148	965	64	150	1,179	965	64	150	1,179	825	64	150	1,039	965	64	150	1,179						

Exhibit 9: Modeling Results -- Gasoline Composition and Volume, by Type and Case

Gasoline Composition & Volume	Intermediate Term																								
	Flat Limit Mode																								
	Ethanol								TBA				ETBE				Mixed Oxygenates								
	RVPw 3				RVPw Conv Hyd 3c				RVPw Deep Hyd 3d				BasU 1				BasU 1								
	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool					
	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool					
Composition (vol%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0					
C4s:	1.1	0.7	2.5	1.3	1.4	0.5	3.1	1.6	1.3	0.5	1.8	1.3	0.5	0.5	1.6	0.6	1.9	1.1	3.7	2.1	0.5	0.5	3.8	0.9	
Butenes																									
I-Butane									1.3		1.0	1.2													
N-Butane	1.1	0.7	2.5	1.3	1.4	0.5	3.1	1.6	0.0	0.5	0.8	0.2	0.5	0.5	1.6	0.6	1.9	1.1	3.7	2.1	0.5	0.5	3.8	0.9	
C5s & Isomerate	10.0			8.3	10.8				9.1	11.5			9.4	8.6	0.3	1.6	7.4	5.8	1.9	1.6	5.1	8.9		7.4	
Raffinate																									
Natural Gas Liquids																									
Naphtha	0.7	0.0	0.0	0.6	1.3	0.0	0.0	1.1	0.0	4.3	0.0	0.2	0.5	11.3	0.2	1.1	3.4	12.0	7.2	4.4	0.3	2.5	5.0	1.0	
C5-160	0.7			0.6	1.3			1.1					0.5	11.3	0.2	1.1	1.8	8.6	4.8	2.6	0.3	2.5	5.0	1.0	
Coker Naphtha																									
160-250									4.3		0.2						1.6	3.4	2.4	1.8					
Alkylate	20.3	0.0	0.0	16.8	17.8	2.0	0.0	15.1	23.3	0.0	0.0	19.0	17.3	4.4	0.0	14.5	14.1	4.8	5.7	12.6	15.8	14.9	0.0	13.9	
Hydrocrackate	21.4	0.8		17.8	17.7			7.9	15.9	23.7	10.8		20.0	11.7	12.3	10.9	11.8	19.2	7.7		16.2	12.3	14.1	11.6	12.5
Dimate																									
Poly Gasoline													0.0			0.0					0.2	0.0		0.1	
FCC Gasoline:	11.5	65.7	86.7	23.0	17.7	60.2	48.9	21.8	7.9	51.4	86.1	20.2	28.2	36.8	40.5	29.5	24.4	34.8	54.2	28.4	27.5	37.3	48.4	29.9	
Full Range	2.8	30.6	74.3	13.6			8.3	1.1	7.9	51.4	86.1	20.2	17.6	34.1	27.7	20.0	20.0	24.8	25.2	21.0	20.3	0.7	20.7	19.5	
Light													0.8	1.8	3.4	1.2	0.9	0.4	0.7	0.9	1.8			1.5	
Light - Desulf.	1.1	8.7			0.9	14.1	10.0							8.3		0.2		2.8		0.3	15.5				
Medium			8.0	1.0		7.3	25.4	3.7					2.6			2.2	2.6	1.9	10.2	3.5		7.7	17.9	2.7	
Medium - Desulf.	5.2	25.4			5.7	10.6	31.6		10.7				4.7			3.9	0.3	7.7		0.6	4.2			3.5	
Heavy	1.0	4.3	0.6				5.1	0.7						1.0	0.1										
Heavy - Desulf.	2.5			2.0	6.2	7.3		5.6					2.6	0.9		2.2	0.5		15.2	2.3	0.9	13.3	9.7	2.8	
Reformate	25.0	17.6	4.7	22.3	23.3	22.5	32.1	25.0	22.4	18.1	4.6	19.9	23.3	19.1	34.9	24.8	17.8	22.8	24.9	19.1	24.0	15.9	26.9	24.2	
Light	9.3	17.6	4.7	9.3	4.5	21.3	32.1	9.2	6.4	18.1	4.6	6.8	12.9	0.4		10.7	4.2	11.5	24.9	7.3	9.5	13.6	12.5	10.2	
Medium																									
Heavy	15.7			13.0	18.7	1.2		15.8	15.9				13.0	10.4	18.8	34.9	14.1	13.7	11.3		11.9	14.5	2.3	14.4	14.0
Oxygenate	10.1	15.2	6.2	10.0	10.1	14.8	8.0	10.3	10.1	14.8	7.5	10.0	9.7	15.2	10.4	10.2	13.4	14.8	2.8	12.2	10.5	14.8	4.3	10.0	
MTBE		12.6	6.2	1.5		14.8	8.0	1.9		14.8	7.5	1.8		12.6	10.4	2.0		14.8	1.7	1.0		14.8	4.3	1.4	
Ethanol	10.1				8.3	10.1			8.5	10.1			8.2		9.7		8.0								
TBA																					7.7			6.4	
ETBE																	13.4		11.0	2.6				2.2	
TAME		2.6		0.1										2.6	0.1			1.1	0.1	0.2			0.1		
DIPE																									
Volume (K Bbl/day)	965	64	150	1,163	965	64	150	1,146	965	64	150	1,179	965	64	150	1,167	965	64	150	1,173	965	64	150	1,166	

Exhibit 9: Modeling Results -- Gasoline Composition and Volume, by Type and Case

Gasoline Composition & Volume	Long Term																												
	Averaging Mode																												
	MTBE								No Oxygenate						Ethanol														
	Ref 2005				HR 630				HR630						BasU				BasU				BasU						
	1				2				1						Alk-100				Alk-175				Alk-50						
	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	
Composition (vol%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0			
C4s:	0.6	1.8	3.5	1.0	0.5	0.5	3.1	0.8	0.5	0.5	1.9	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		
Butenes																													
I-Butane																													
N-Butane	0.6	1.8	3.5	1.0	0.5	0.5	3.1	0.8	0.5	0.5	1.9	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		
C5s & Isomerate	4.4	4.5	13.5	5.6	7.3		14.5	7.8	11.8		1.4	9.7	4.4	7.6	2.3	4.3	4.3	4.4	1.4	3.9	5.0	11.0	2.3	5.0					
Raffinate																													
Natural Gas Liquids																													
Naphtha	2.4	0.0	4.8	2.6	0.7	0.0	4.8	1.2	1.6	0.7	0.0	1.3	7.3	0.0	0.0	5.9	7.3	0.0	0.0	6.0	4.8	0.0	0.0	3.9					
C5-160	2.4		4.8	2.6	0.7		4.8	1.2	1.6	0.7		1.3	1.9			1.5	2.1			1.7	1.7			1.4					
Coker Naphtha																													
160-250													5.4			4.4	5.3			4.3	3.1			2.5					
Alkylate	15.7	14.1	0.0	13.6	16.0	15.5	0.0	13.9	30.8	0.0	0.0	25.0	26.7	0.0	0.0	21.8	28.0	0.9	0.0	22.9	24.2	1.4	0.0	19.8					
Hydrocrackate	18.8	0.1		15.4	17.6	13.6		15.1	9.0	13.3	9.2	9.2	11.8	13.0	7.0	11.3	11.7	11.7	9.5	11.4	13.8	13.6	4.9	12.7					
Dimate																													
Poly Gasoline	0.2	1.1		0.2	0.1			0.1	3.4			2.7	0.1			0.1	0.2			0.2	0.9			0.7					
FCC Gasoline:	24.6	52.3	52.8	29.7	25.2	43.5	49.0	29.2	19.0	47.4	47.8	24.5	22.3	43.2	50.7	27.1	22.2	49.3	46.5	26.8	20.5	41.9	62.1	27.1					
Full Range	19.7		18.2	18.4	18.7	9.2	18.2	18.1	12.3	44.9	6.4	13.4	12.0	41.5	36.7	16.8	12.0	49.3	27.1	16.0	11.4	40.3	38.5	16.5					
Light	2.6	8.9		2.6	2.2	15.6	0.3	2.7	0.6	0.8	14.3	2.4			13.9	1.8			16.4	2.1			10.9	1.4					
Light - Desulf.																													
Medium	0.5	5.2	20.4	3.3	0.6	4.3	20.5	3.4			12.9	1.7	2.0	1.6		1.7	1.9			1.5	0.5	0.9		0.5					
Medium - Desulf.	1.6	29.0		2.9	3.6			2.9	5.8			4.7	5.7			4.6	6.0			4.9	7.8			6.3					
Heavy								0.5	0.1		14.3	1.9							3.0	0.4			0.7	12.7	1.7				
Heavy - Desulf.	0.2	9.3	14.2	2.5	0.1	14.4	9.5	2.1	0.3	1.7		0.4	2.7			2.2	2.3			1.9	0.8			0.7					
Reformate	21.7	14.5	23.8	21.6	22.6	12.0	27.0	22.6	23.9	22.9	28.8	24.5	19.1	20.5	32.0	20.9	18.0	18.0	33.8	20.1	22.4	16.4	23.0	22.2					
Light	8.2	5.5	19.1	9.4	9.0	11.9	12.6	9.6	14.3	22.9		12.9	9.7	12.4	1.2	8.8	9.3	18.0		8.6	7.9	0.5	23.0	9.5					
Medium											28.8	3.8							4.3	0.5									
Heavy	13.6	9.0	4.7	12.2	13.6	0.2	14.3	13.0	9.6			7.8	9.4	8.1	30.7	12.1	8.7		29.6	10.9	14.5	16.0		12.7					
Oxygenate	11.6	11.5	1.6	10.3	9.9	15.0	1.6	9.1	0.0	15.2	10.8	2.3	7.8	15.2	7.5	8.1	7.8	15.2	8.3	8.2	7.8	15.2	7.1	8.1					
MTBE	11.4	11.5	1.6	10.1	9.8	13.8	1.6	9.0		12.7	10.8	2.1		12.7	7.5	1.7		12.7	8.3	1.8		12.7	7.1	1.6					
Ethanol												7.8			6.3	7.8				6.3	7.8			6.3					
TBA																													
ETBE																													
TAME	0.2				0.1	0.1	1.2		0.1		2.5		0.1		2.5		0.1		2.5		0.1		2.5		0.1				
DIPE																													
Volume (K Bbl/day)	1,022	68	161	1,251	1,022	68	161	1,251	982	68	161	1,211	1,022	68	161	1,251	1,022	68	161	1,251	997	68	161	1,226					

Exhibit 9: Modeling Results -- Gasoline Composition and Volume, by Type and Case

Gasoline Composition & Volume	Long Term																							
	Averaging Mode																							
	Ethanol								TBA								ETBE				Mixed Oxygenates			
	RVPw				BasU				HR630				RVPw				BasU				BasU			
	3				USban				5				USban				6				1			
	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool
Composition (vol%)			infeas		100.0	100.0	100.0	100.0			see 4						100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
C4s:					0.5	0.5	0.5	0.5									0.5	0.5	1.4	0.6	1.8	1.1	3.4	2.0
Butenes																								
I-Butane																								
N-Butane					0.5	0.5	0.5	0.5									0.5	0.5	1.4	0.6	1.8	1.1	3.4	2.0
C5s & Isomerate					5.2		3.9	4.8									8.3	0.8	1.4	7.0	4.7		9.4	5.1
Raffinate																								
Natural Gas Liquids																								
Naphtha					2.9	22.1	0.0	3.5									1.2	9.8	0.0	1.5	3.1	16.6	6.9	4.3
C5-160					1.3	12.6		1.7									1.2	9.8		1.5	1.4	14.2	4.7	2.6
Coker Naphtha																								
160-250					1.6	9.4		1.8													1.7	2.4	2.1	1.8
Alkylate					23.7	29.6	1.9	21.2									18.7	2.4	0.0	15.4	14.6	8.5	2.5	12.7
Hydrocrackate					15.5			12.7									11.7	11.4	12.5	11.8	19.0	12.9		16.2
Dimate																								
Poly Gasoline					0.6	1.6		0.6									0.1			0.1				0.0
FCC Gasoline:					19.9	30.8	66.9	26.5									26.7	42.7	38.9	29.1	26.1	18.4	47.6	28.5
Full Range					11.1	22.0	52.9	17.1									16.3	42.7	21.8	18.4	18.7	24.2	18.4	19.1
Light							7.8	1.0									0.7	13.9	2.3	2.1	5.5		2.1	2.8
Light - Desulf.																								
Medium					0.8	2.9		0.8									2.6			2.1	3.1	5.8	14.1	4.6
Medium - Desulf.					6.7			5.5									4.9			4.0	1.1		0.9	0.4
Heavy							6.2	0.8										3.2	0.4					1.6
Heavy - Desulf.					1.3	5.8		1.4									2.2			1.8	1.1	7.1	9.2	2.5
Reformate					23.9	7.7	25.7	23.2									22.6	17.2	34.4	23.8	17.2	27.4	28.3	19.1
Light					9.1	7.7	17.7	10.1									13.4	1.0		11.0	6.0	9.5	14.2	7.3
Medium																								
Heavy					14.8		8.0	13.1									9.2	16.2	34.4	12.8	11.1	17.9	14.0	11.9
Oxygenate					7.8	7.8	1.1	6.9									10.2	15.2	11.4	10.6	13.4	15.2	2.1	12.0
MTBE																	12.7	11.4	2.2		12.7	2.1	1.0	
Ethanol					7.8	7.8		6.8																14.8
TBA																	10.2			8.3				2.4
ETBE																				13.4			10.9	9.8
TAME							1.1	0.1									2.5		0.1		2.5		0.1	0.2
DIPE																								0.1
Volume (K Bbl/day)					1,022	68	161	1,251									1,022	68	161	1,251	1,022	68	161	1,251

Exhibit 9: Modeling Results -- Gasoline Composition and Volume, by Type and Case

Gasoline Composition & Volume	Long Term																										
	Flat Limit Mode																										
	MTBE												No Oxygenate				Ethanol										
	Ref 2005				Conv FCC Feed Hydro				Deep FCC Feed Hydro				HR 630				HR 630				BasU						
	1				1c				1d				2				1				Alk-100						
	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool			
Composition (vol%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0			
C4s:	0.6	3.2	3.9	1.2	0.6	2.6	3.0	1.0	0.6	1.7	3.5	1.1	0.5	0.5	3.4	0.9	0.5	0.5	3.5	0.9	0.5	0.5	0.5	0.5	0.5	see 1	
Butenes																											
I-Butane																											
N-Butane	0.6	3.2	3.9	1.2	0.6	2.6	3.0	1.0	0.6	1.7	3.5	1.1	0.5	0.5	3.4	0.9	0.5	0.5	3.5	0.9	0.5	0.5	0.5	0.5	0.5		
C5s & Isomerate	6.3	7.0		5.6	6.8	0.4	10.8	7.1	7.6			6.2	6.8		13.2	7.3	9.6		1.4	8.1	4.4	7.3	1.4	4.2			
Raffinate																											
Natural Gas Liquids																											
Naphtha	2.4	0.0	4.8	2.6	0.0	7.3	6.1	1.3	1.6	8.8	7.0	2.7	0.9	0.0	4.9	1.3	2.1	1.2	0.0	1.8	6.1	2.9	0.0	5.2			
C5-160	2.4		4.8	2.6	0.0	7.3	6.1	1.3	1.6	8.8	4.8	2.4	0.9		4.9	1.3	2.1	1.2		1.8	1.9	2.9		1.8			
Coker Naphtha												2.2	0.3														
160-250																					4.1			3.4			
Alkylate	14.2	13.7	6.0	13.2	14.9	15.3	0.0	13.3	13.0	16.5	7.3	12.5	16.1	14.2	0.1	14.1	25.6	15.5	0.0	21.9	25.3	1.9	0.0	21.0			
Hydrocrackate	17.1	0.1	8.2	15.2	16.4	14.0		14.5	19.1	6.1		15.9	16.7	15.2	0.5	14.7	8.8	11.2	14.4	9.8	13.2	12.9	3.5	12.1			
Dimate																											
Poly Gasoline	0.1	0.9		0.1									0.2			0.2	2.0			1.7	0.1			0.1			
FCC Gasoline:	26.8	45.7	46.9	29.7	26.8	13.9	50.7	27.3	23.4	50.7	55.0	29.0	26.4	37.7	51.6	29.6	24.7	43.6	40.0	27.1	22.0	43.0	59.6	27.1			
Full Range	20.0		24.2	19.7			22.3	2.9	23.4	50.7	55.0	29.0	19.4	8.4	18.5	18.9	17.6	32.6	11.0	17.7	11.4	42.9	48.2	18.0			
Light	1.6			1.3	3.7	2.8		3.2					2.2			1.8	0.6		5.9	1.3			2.0	0.3			
Light - Desulf.	0.7	5.9			3.1								0.2	13.4				10.5	2.7				9.4				
Medium	1.5	8.0	14.2	3.6	4.4	11.2	16.9	6.5					0.8	6.0	20.2	3.6			10.6	1.4	2.2			1.8			
Medium - Desulf.	1.0	26.5		2.2	8.6			7.2					3.3			2.8	5.5			4.5	5.6			4.7			
Heavy																	0.3	9.9	12.9	2.5	1.0	0.2		0.8	2.8	0.1	2.3
Heavy - Desulf.	1.9	5.3	8.4	3.0	7.1		11.6	7.5																			
Reformate	21.0	17.6	28.6	22.0	23.1	34.6	27.8	24.9	23.2	4.3	25.5	22.4	23.4	17.5	24.7	23.4	26.7	12.9	26.6	26.1	20.7	16.2	29.7	21.9			
Light	9.8		13.2	9.8	9.0	7.4	18.0	10.3	9.4	2.9	14.0	9.7	9.7	11.1	17.3	10.9	16.5			13.6	10.9	0.4	4.4	9.6			
Medium																		1.0	0.1								
Heavy	11.2	17.6	15.4	12.2	14.1	27.2	9.7	14.6	13.7	1.4	11.5	12.8	13.7	6.4	7.3	12.6	10.1	12.9	25.6	12.4	9.8	15.8	25.3	12.3			
Oxygenate	11.5	11.9	1.6	10.4	11.5	11.9	1.6	10.5	11.5	11.9	1.6	10.3	9.0	14.8	1.6	8.4	0.0	15.2	14.0	2.7	7.8	15.2	5.2	7.9			
MTBE	11.5	9.4	1.6	10.2	11.5	9.4	1.6	10.4	11.5	9.4	1.6	10.1	8.8	14.8	1.6	8.3		12.7	14.0	2.6		12.7	5.2	1.4			
Ethanol																					7.8			6.4			
TBA																											
ETBE																											
TAME		2.5		0.1		2.5		0.1		2.5		0.1	0.2			0.1		2.5		0.1		2.5		0.1			
DIPE																											
Volume (K Bbl/day)	1,022	68	161	1,240	1,022	68	161	1,220	1,022	68	161	1,251	1,022	68	161	1,240	1,002	68	161	1,219	1,022	68	161	1,236			

Exhibit 9: Modeling Results -- Gasoline Composition and Volume, by Type and Case

Gasoline Composition & Volume	Long Term																										
	Flat Limit Mode																										
	Ethanol								TBA								ETBE				Mixed Oxygenates						
	RVPw 3				RVPw Conv Hyd 3c				RVPw Deep Hyd 3d				BasU 1				BasU 1				BasU 1						
	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool			
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0			
Composition (vol%)	1.1	1.0	1.8	1.2	1.1	0.5	3.3	1.4	1.2	0.9	0.6	1.1	0.5	0.5	1.4	0.6	2.0	1.5	3.0	2.1	1.5	0.9	3.7	1.7			
C4s:																											
Butenes																											
I-Butane																											
N-Butane	1.1	1.0	1.8	1.2	1.1	0.5	3.3	1.4	1.2	0.9	0.6	1.1	0.5	0.5	1.4	0.6	2.0	1.5	3.0	2.1	1.5	0.9	3.7	1.7			
C5s & Isomerate	9.8				8.1	11.9			10.0	11.5			9.4	8.3	0.8	1.4	7.0	4.1	7.6	9.0	4.9	6.3		2.0	5.4		
Raffinate																											
Natural Gas Liquids																											
Naphtha	1.1	0.0	0.0	0.9	1.2	0.0	0.0	1.0	1.2	1.8	0.0	1.1	1.0	9.8	0.0	1.3	5.1	0.0	1.4	4.3	2.2	2.9	4.8	2.6			
C5-160	1.1				0.9	1.2			1.0	1.2	1.8		1.1	1.0	9.8		1.3	3.1			2.6	2.2	2.9	4.8	2.6		
Coker Naphtha																											
160-250																			2.0		1.4	1.8					
Alkylate	19.9	0.0	0.0	16.4	18.0	0.4	0.0	15.2	16.8	0.0	0.0	13.8	17.4	2.4	0.0	14.3	14.6	2.1	3.5	12.5	14.1	14.0	3.6	12.8			
Hydrocrackate	20.8	1.3		17.3	17.8			15.0	19.5	5.5		16.3	11.8	11.4	10.7	11.6	19.2	8.8			16.2	17.3	15.1	6.5	15.8		
Dimate																											
Poly Gasoline																0.2		0.2									
FCC Gasoline:	12.3	65.6	88.7	24.1	17.2	58.8	59.6	22.6	14.9	59.1	88.1	26.3	27.4	42.7	40.5	29.9	23.0	47.4	57.5	28.8	25.8	34.3	51.6	29.6			
Full Range	1.9	34.3	83.7	14.4				27.7	3.7	5.5	51.0	83.6	18.2	16.9	42.7	27.1	19.6	14.5	41.4	47.3	20.2	19.4		22.5	18.8		
Light								0.9		0.1				4.5	0.6	0.7	12.5	2.2	1.6	0.6	1.8	1.6	1.6	14.5			
Light - Desulf.	1.1	6.6			1.6	13.6	7.0		0.2	8.1																	
Medium					5.0	0.6		6.0	9.1	1.5						2.3			1.9	5.2			4.2	3.0	5.0	15.8	4.7
Medium - Desulf.	6.1	24.7			6.4	8.8	30.4	15.8	11.2	5.8				4.8	4.9			4.0		5.4		0.3	1.2		0.9		
Heavy																	0.9	0.1									
Heavy - Desulf.	3.3				2.7	6.8	7.8		6.2	3.3				2.7	2.5			2.0	1.7		8.5	2.5	0.6	14.8	13.3	3.0	
Reformate	24.9	16.9	3.1	21.9	22.8	25.1	31.3	24.7	24.9	17.6	4.6	22.0	23.7	17.2	35.7	24.9	18.5	17.8	23.4	19.1	20.3	18.0	25.7	20.9			
Light	9.3	16.9	3.1	9.1	4.0	25.1	31.3	9.0	8.7	17.6	4.6	8.7	12.7	1.0		10.4	4.3	13.8	23.4	7.2	6.6	18.0	20.0	8.9			
Medium																											
Heavy	15.6				12.9	18.7			15.8	16.1				13.3	11.0	16.2	35.7	14.4	14.2	3.9		11.9	13.7		5.7	12.0	
Oxygenate	10.1	15.2	6.4	10.0	10.1	15.2	5.7	10.1	10.1	15.2	6.6	10.0	9.7	15.2	10.2	10.1	13.4	14.8	2.2	12.0	12.5	14.8	2.2	11.3			
MTBE		12.7	6.4	1.5			12.6	5.7	1.5		12.7	6.6	1.6		12.7	10.2	2.0		14.8	1.2	1.0		14.8	2.2	1.1		
Ethanol	10.1				8.3	10.1			8.5	10.1			8.3				9.7		7.9				2.4		2.0		
TBA																				13.4		10.9	9.8		8.0		
ETBE		2.5			0.1		2.6		0.1		2.5		0.1		2.5		0.1			1.0	0.1	0.2		0.1			
TAME																				1.0	0.1	0.2		0.1			
DIPE																											
Volume (K Bbl/day)	1,022	68	161	1,235	1,022	68	161	1,214	1,022	68	161	1,243	1,022	68	161	1,251	1,022	68	161	1,251	1,022	68	161	1,251			

Exhibit 9: Modeling Results -- Gasoline Composition and Volume, by Type and Case
Supplement

Gasoline Composition & Volume	Intermediate Term												Long Term															
	Recipe				Averaging Mode				Flat Limit Mode				Recipe				Averaging Mode											
	Ethanol				No Oxygen				No Oxygen				Ethanol				Ethanol				No Oxygen							
	RVPw				HR 630				HR 630				RVPw				BasU				HR 630							
	7				USban				USban				7				Alk-zero				USban							
	CARB				CARB				CARB				CARB				CARB				CARB							
Composition (vol%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0				
C4s:	0.6	0.5	2.4	0.8	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	1.6	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			
Butenes					0.5				0.4	0.5	0.5		0.4															
I-Butane						0.5	0.1																					
N-Butane	0.6	0.5	2.4	0.8		0.5		0.0			0.5	0.1	0.6	1.6	0.5	0.6	0.5	0.5	0.5	0.5		0.5	0.5	0.1	0.5			
C5s & Isomerate	6.1	4.4	0.9	5.4	11.8	8.7	4.2	10.2	9.5	9.0	9.3	9.5	4.9	13.5	6.3	5.6	5.0	10.1	2.3	5.0	12.9		1.4	10.6	11.3	1.5		
Raffinate																												
Natural Gas Liquids																												
Naphtha	4.7	9.9	0.1	4.4	0.0	3.3	0.0	0.2	0.0	9.2	0.0	0.7	2.2	0.0	10.5	3.2	4.4	0.0	0.0	3.7	0.6	15.5	2.7	1.8	2.2	0.0		
C5-160	2.6	8.6		2.6		3.3		0.2		9.2		0.7	1.6		10.5	2.6	1.8			1.5	0.6	7.1	2.7	1.3	2.2	1.8		
Coker Naphtha																												
160-250	2.0	1.4	0.1	1.8									0.6			0.5	2.6			2.2		8.4		0.5				
Alkylate	18.6	2.3	0.0	15.4	36.2	23.4	3.6	29.5	31.3	24.4	5.8	27.0	17.1	1.2	0.0	14.2	23.4	1.8	0.0	19.5	28.8	27.9	8.0	25.9	27.9	1.8		
Hydrocrackate	18.4	25.5	8.8	17.7	12.2				9.1	10.6			8.2	20.0	7.7	8.8	18.0	15.1	13.5	4.5	13.8	9.0		7.2	8.8	4.8	7.7	
Dimate																												
Poly Gasoline					0.2			0.1		1.6		0.1					1.0			0.9	2.6			2.0	2.9			
FCC Gasoline:	20.6	42.5	61.3	26.5	23.4	52.9	67.2	33.4	29.9	40.2	55.8	34.1	25.7	46.0	41.3	28.2	17.6	43.3	73.8	25.4	17.8	40.7	60.6	24.9	18.3	59.7		
Full Range	9.6	42.5	54.6	17.2	12.6	18.3	62.5	21.8	20.8		34.9	21.9	15.6	38.1	18.6	17.4	8.6	42.4	55.6	16.7	10.2	31.0	27.4	14.0	11.4	34.1		
Light	1.7		5.4	2.1	0.6		4.8	1.3	0.9	0.1	1.7	1.0	0.5		10.8	1.8			0.2	0.0	0.5		8.2	1.6	0.8	0.6		
Light - Desulf.	0.7										7.7		0.9	1.0					9.4				4.1			5.8		
Medium	4.3			3.5		5.9		0.4	2.0	6.9	6.5	3.1	3.9			3.2	0.6			0.5		3.7	5.1	1.0				
Medium - Desulf.	4.2			3.5	9.8	25.6		9.3	5.1	24.2		5.6	3.9	6.1			3.5	7.1			5.9	7.1	4.1		6.0	5.0	15.4	5.0
Heavy			1.2	0.2							5.0	0.8	0.9	0.8	11.9	2.4		0.9	8.6	1.2		15.8	2.3			4.8	0.6	
Heavy - Desulf.					0.5	3.0		0.6	1.2	9.0		1.6					1.3			1.1	0.1	1.8		0.2	1.1	4.5	1.2	
Reformate	20.9	0.0	13.0	18.9	15.8	3.6	24.5	16.4	18.2	7.3	28.7	19.4	19.6	14.8	17.8	19.2	25.1	15.5	5.4	22.3	27.8	7.7	26.8	26.6	28.2	18.0	23.2	
Light	9.4			7.7	15.8	3.6	24.5	16.4	18.2	7.3	9.5	16.2	10.2	0.1	0.8	8.5	10.1	1.3	5.4	9.1	12.4	7.7	26.8	14.3	12.8	18.0	10.1	
Medium												7.4			6.1					5.9				4.7				
Heavy	11.6		13.0	11.2							19.2	3.2	2.0	14.8	17.0	4.7	15.0	14.2		13.2	9.5			7.6	15.3		13.1	14.4
Oxygenate	10.1	14.8	13.5	10.8	0.0	7.8	0.0	0.6	0.0	7.8	0.0	0.6	10.1	15.2	14.8	11.0	7.8	15.2	13.5	9.0	0.0	7.8	0.0	0.5	0.0	15.2	9.8	
MTBE		14.8	12.3	2.4										12.7	14.8	2.6		12.7	13.5	2.5						12.6	9.8	2.0
Ethanol	10.1			8.3		7.8		0.6		7.8		0.6	10.1			8.3	7.8			6.4		7.8		0.5				
TBA																												
ETBE																												
TAME				1.1	0.1									2.5		0.1		2.5		0.1						2.5		0.1
DIPE																												
Volume (K Bbl/day)	965	64	150	1,172	637	64	150	851	700	64	150	903	1,022	68	161	1,241	1,022	68	161	1,236	892	68	161	1,114	1,022	68	161	1,238

Exhibit 9: Modeling Results -- Gasoline Composition and Volume, by Type and Case
Supplement

Gasoline Composition & Volume	Long Term																
	Flat Limit Mode																
	Ethanol								No Oxygen								
	BasU				BasU				HR 630				HR 630				
	USban		Alk-zero		USban		2		Alk-zero		3						
	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	CARB	Ariz.	Conv.	Pool	
Composition (vol%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
C4s:	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.6	0.7	
Butenes																	
I-Butane																	
N-Butane	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.6	0.7	
C5s & Isomerate	4.5	6.5	3.2	4.4	4.5	9.8	2.3	4.6	10.9		9.6	10.2	10.6		1.4	8.9	
Raffinate																	
Natural Gas Liquids																	
Naphtha	5.9	10.8	0.0	5.4	7.4	0.0	0.0	6.1	0.3	8.5	5.1	1.5	1.8	6.4	0.0	1.9	
C5-160	2.1	2.3		1.8	1.8			1.5	0.3	8.5	5.1	1.5	1.8	6.4		1.9	
Coker Naphtha																	
160-250	3.8	8.5		3.6	5.6			4.6									
Alkylate	23.6	25.6	1.6	21.0	22.5	1.6	0.0	18.7	25.3	26.2	6.0	22.8	24.4	0.3	0.0	20.1	
Hydrocrackate	13.0	15.7		11.5	12.5	13.3	5.4	11.7	10.3			8.3	9.4	2.9	14.9	9.9	
Dimate																	
Poly Gasoline		2.7		0.1	0.3			0.3	2.2			1.8	2.7			2.3	
FCC Gasoline:	21.5	18.9	66.5	26.7	19.4	43.4	72.8	26.8	22.0	54.2	42.8	26.2	22.4	56.5	40.2	25.8	
Full Range	11.7		58.2	17.1	8.9	42.6	57.3	17.1	16.1	32.5		14.9	15.9	36.0	3.2	15.5	
Light								2.1	0.3	0.8		8.1	1.8			10.7	
Light - Desulf.												5.6			4.3	6.6	
Medium	2.2	6.6		2.2	2.2			1.8		3.2	18.0	2.7			7.0	0.9	
Medium - Desulf.	5.5			4.5	6.0				4.9	4.2	15.6		4.3	5.8	16.2		5.7
Heavy								0.8	5.0	0.7		11.2	1.6			12.8	
Heavy - Desulf.	2.1	12.3		2.4	2.4				2.0	0.9	2.9		0.9	0.8		0.6	
Reformate	23.4	11.6	27.1	23.3	25.1	16.2	4.1	22.1	28.4	2.9	35.9	28.2	28.1	18.2	27.1	27.8	
Light	10.2	11.6	8.0	10.0	10.8	1.7		9.1	15.9	2.9	5.4	13.8	15.7	6.2		13.2	
Medium												16.2	2.3			4.7	
Heavy	13.2		19.1	13.3	14.2	14.5	4.1	13.1	12.5		14.2	12.1	12.5	12.0	22.3	13.9	
Oxygenate	7.8	7.8	1.1	6.9	7.8	15.2	14.8	9.2	0.0	7.8	0.0	0.5	0.0	15.2	14.8	2.8	
MTBE								12.7	14.8	2.6					12.7	14.8	
Ethanol	7.8	7.8		6.8	7.8			6.4		7.8		0.5					
TBA																	
ETBE																	
TAME				1.1	0.1		2.5		0.1					2.5		0.1	
DIPE																	
Volume (K Bbl/day)	1,022	68	161	1,244	1,022	68	161	1,238	917	68	161	1,137	1,002	68	161	1,217	

Exhibit 10: Summary of Effects of California MTBE Ban, by Case

Measure	Intermediate Term													
	Averaging Mode													
	MTBE		No Oxy	Ethanol							TBA	ETBE	Mixed Oxy	
	Ref 2002	HR 630	HR630	BasU Alk-100	BasU Alk-175	BasU Alk-50	HR630	RVPw	BasU USban	HR630 USban	RVPw USban	BasU	BasU	
1	2	1	1a	1b	1c	2	3	4	5	6	1	1	1	
COSTS														
Total Average Cost (¢/gal.)	-	-0.2	8.8	7.5	6.7	9.9	see 1a	infeas	11.7	see 4	infeas	1.4	2.4	0.2
Variable Cost		-0.2	8.0	5.6	4.8	7.7			9.1			1.1	1.6	0.0
Refinery Capital Charge		0.0	0.0	0.0	0.0	0.0			0.1			0.0		
Ancillary Refining Cost			1.3	0.9	0.8	1.3			1.5			0.3	0.3	0.1
Logistics Cost				0.1	0.1	0.1			0.1					
Mileage Loss		-0.1	-0.5	0.9	1.0	0.8			0.8			0.0	0.5	0.1
Total Seasonal Cost (\$ million)	-	-20	660	560	500	730			930			100	180	20
Variable Cost		-10	600	410	360	570			720			80	120	0
Refinery Capital Charge		0	0	0	0	0			10			0		
Ancillary Refining Cost			100	70	60	90			120			20	20	10
Logistics Cost				10	10	10			10					
Mileage Loss		-10	-40	70	70	60			70			0	40	10
Refinery Investment (\$million)	-	0	3	23	3	17			75			12	0	0
IMPORTS/EXPORTS (K bbl/d)														
Oxygenates	108	94	6	78	75	79			80			112	129	117
MTBE	108	94	6	3	0	5						23		16
Ethanol				75	75	75			80					
TBA												89		35
ETBE													129	66
TAME														
Other Imports	11	13	430	249	203	330			370			40	11	11
Isobutane		2	11	13	10	14			21			7		
Alkylate	11	11	111	111	152	61			86			33	11	11
CARBOB			255	65		175			171					
Jet Fuel & EPA Diesel			54	60	40	79			92					
Rejected Blendstocks	0	0	203	64	50	106			99			3	0	0
Mixed Butylenes									2					
Pentanes			0	2	0	2			2					
Light Coker Naphtha							21		11					
Light FCC Gasoline		8	19	18	19				19					
Heavy FCC Gasoline		9	12	9	11				11			3		
Naphtha (250 - 325 °F)			158	31	24	53			54					
Heavy Reformate			28											
CAPACITY UTILIZATION (%)														
Crude Distillation	97	97	91	90	91	88			85			96	94	96
Conversion	95	96	90	88	90	86			83			94	93	95
Upgrading	79	84	68	69	70	65			64			89	71	80

Exhibit 10: Summary of Effects of California MTBE Ban, by Case

Measure	Intermediate Term												
	Flat Limit Mode												
	MTBE				No Oxy	Ethanol					TBA	ETBE	Mixed Oxy
	Ref 2002	Conv FCC Feed Hydro	Deep FCC Feed Hydro	HR 630		BasU	Alk-100	HR630	RVPw	RVPw			
Measure	1	1c	1d	2	1	1	2	3	3c	3d	1	1	1
COSTS													
Total Average Cost (¢/gal.)	-	-	-	-0.8	4.3	6.1	see 1	5.4	4.4	9.2	0.5	2.5	-0.2
Variable Cost				-0.4	4.3	4.4		3.1	2.4	6.4	0.5	1.6	0.0
Refinery Capital Charge				0.0	0.0	0.2		0.1	0.1	0.0	0.0		
Ancillary Refining Cost					0.7	0.8		0.6	0.5	1.1	0.2	0.3	
Logistics Cost						0.1		0.1	0.1	0.1			
Mileage Loss				-0.3	-0.8	0.7		1.5	1.3	1.7	-0.2	0.5	-0.2
Total Seasonal Cost (\$ million)	-	-	-	-50	320	450		400	340	680	40	190	-10
Variable Cost				-30	320	320		230	180	470	40	120	0
Refinery Capital Charge				0	0	10		10	10	0	0		
Ancillary Refining Cost					60	60		40	40	80	10	30	
Logistics Cost						10		10	10	10			
Mileage Loss				-20	-60	50		110	100	120	-10	40	-10
Refinery Investment (\$million)	-	-	-	0	4	75		48	43	8	0	0	0
IMPORTS/EXPORTS (K bbl/d)													
Oxygenates	108	108	108	75	12	79		113	107	118	108	129	106
MTBE	108	108	108	75	12	4		16	10	21	24		16
Ethanol						75		97	97	97			
TBA											84		65
ETBE												129	25
TAME													
Other Imports	11	11	11	14	302	174		70	23	282	15	11	11
Isobutane				3	7	11		3			4		
Alkylate	11	11	11	11	111	111		49	21	111	11	11	11
CARBOB					140								
Jet Fuel & EPA Diesel					44	52		22		171			
Rejected Blendstocks	0	0	0	0	126	42		14	56	0	0	0	0
Mixed Butylenes													
Pentanes					0	2							
Light Coker Naphtha						1							
Light FCC Gasoline						20		14	38				
Heavy FCC Gasoline					9	11			18				
Naphtha (250 - 325 °F)					116	7							
Heavy Reformate													
CAPACITY UTILIZATION (%)													
Crude Distillation	97	96	97	98	93	93		93	98	79	98	94	98
Conversion	95	96	97	97	93	92		93	97	82	96	93	96
Upgrading	78	84	79	88	74	74		83	88	73	90	71	88

Exhibit 10: Summary of Effects of California MTBE Ban, by Case

Measure	Long Term													
	Averaging Mode													
	MTBE		No Oxy	Ethanol								TBA	ETBE	Mixed Oxy
	Ref 2005	HR 630	HR630	BasU Alk-100	BasU Alk-175	BasU Alk-50	HR630	RVPw	BasU USban	HR630 USban	RVPw USban	BasU	BasU	BasU
1	2	1	1a	1b	1c	2	3	4	5	6	1	1	1	1
COSTS														
Total Average Cost (¢/gal.)	-	-0.3	3.7	2.4	2.5	2.4	see 1a	infeas	3.7	see 4	infeas	1.0	0.0	-0.3
Variable Cost		-0.2	1.8	1.3	1.3	0.6			1.7			0.7	-0.5	-0.7
Refinery Capital Charge		0.0	2.2	0.2	0.1	1.0			1.1			0.1		
Ancillary Refining Cost			0.7	0.3	0.3	0.3			0.5			0.2		
Logistics Cost				0.1	0.1	0.1			0.1					
Mileage Loss		-0.1	-0.9	0.6	0.7	0.4			0.3			0.0	0.5	0.3
Total Seasonal Cost (\$ million)	-	-20	290	190	190	190			310			90	0	-20
Variable Cost		-10	140	100	100	40			140			60	-40	-50
Refinery Capital Charge		0	170	10	10	80			90			10		
Ancillary Refining Cost			50	20	20	30			40			20		
Logistics Cost				10	10	10			10					
Mileage Loss		-10	-70	50	50	30			30			0	40	30
Refinery Investment (\$million)	-	3	1,104	86	59	519			595			38	0	0
IMPORTS/EXPORTS (K bbl/d)														
Oxygenates	115	100	14	88	89	87			85			119	137	130
MTBE	115	100	14	9	10	8						15		5
Ethanol				79	79	79			85					
TBA												104		25
ETBE													137	101
TAME														
Other Imports	11	14	186	120	134	96			98			33	11	11
Isobutane		2	34	8	10	12			12			3		
Alkylate	11	11	111	111	124	61			86			30	11	11
CARBOB			40			23								
Jet Fuel & EPA Diesel														
Rejected Blendstocks	0	0	16	45	29	49			78			0	0	0
Mixed Butylenes			16	12		10			36					
Pentanes				25	24	25			25					
Light Coker Naphtha														
Light FCC Gasoline				8	5	15			17					
Heavy FCC Gasoline														
Naphtha (250 - 325 °F)														
Heavy Reformate														
CAPACITY UTILIZATION (%)														
Crude Distillation	98	98	94	97	95	98			100			98	96	97
Conversion	97	97	93	96	94	97			98			96	95	96
Upgrading	83	89	94	81	78	84			87			92	75	80

Exhibit 10: Summary of Effects of California MTBE Ban, by Case

Measure	Long Term												
	Flat Limit Mode												
	MTBE				No Oxy	Ethanol					TBA	ETBE	Mixed Oxy
	Ref 2005	Conv FCC Feed Hydro	Deep FCC Feed Hydro	HR 630		BasU	Alk-100	HR630	RVPw	RVPw			
Measure	1	1c	1d	2	1	1	2	3	3c	3d	1	1	1
COSTS													
Total Average Cost (¢/gal.)	-	-	-	-1.5	0.9	1.9	see 1	1.0	0.3	1.0	0.3	0.0	-0.4
Variable Cost				-1.2	1.1	0.9		-0.8	-1.4	-1.2	0.3	-0.5	-0.7
Refinery Capital Charge				0.0	0.8	0.1		0.3	0.3	0.9	0.0		
Ancillary Refining Cost					0.4	0.3					0.2		
Logistics Cost						0.1		0.1	0.1	0.1			
Mileage Loss				-0.3	-1.3	0.6		1.4	1.3	1.2	-0.2	0.5	0.2
Total Seasonal Cost (\$ million)	-	-	-	-120	70	150		80	30	70	30	0	-30
Variable Cost				-100	80	70		-60	-110	-100	30	-40	-50
Refinery Capital Charge				0	60	10		20	30	70	0		
Ancillary Refining Cost					30	20					10		
Logistics Cost						10		10	10	10			
Mileage Loss				-20	-100	40		110	100	90	-10	40	20
Refinery Investment (\$million)	-	-	-	0	394	38		140	189	499	1	0	0
IMPORTS/EXPORTS (K bbl/d)													
Oxygenates	115	115	115	91	19	84		110	109	110	112	137	127
MTBE	115	115	115	91	19	5		7	6	7	13		2
Ethanol						79		103	103	103			
TBA											99		25
ETBE												137	101
TAME													
Other Imports	11	11	11	13	143	102		45	26	20	18	11	11
Isobutane				1	12	4		6	5	9	2		
Alkylate	11	11	11	11	111	98		39	21	11	16	11	11
CARBOB					20								
Jet Fuel & EPA Diesel													
Rejected Blendstocks	0	0	0	0	29	44		8	7	0	0	0	0
Mixed Butylenes					29	8							
Pentanes						24							
Light Coker Naphtha													
Light FCC Gasoline						12		8	7				
Heavy FCC Gasoline													
Naphtha (250 - 325 °F)													
Heavy Reformate													
CAPACITY UTILIZATION (%)													
Crude Distillation	98	99	99	100	98	98		96	96	97	99	95	97
Conversion	97	98	98	98	97	96		96	96	97	98	95	96
Upgrading	83	91	83	90	96	82		87	92	87	94	74	80

Exhibit 10: Summary of Effects of California MTBE Ban, by Case
Supplement

Measure	Intermediate Term			Long Term							
	Mode			Mode							
	Recipe Ethanol	Averaging No Oxygen	Flat No Oxygen	Recipe Ethanol	Averaging			Flat			
	RVPw	HR 630 USban	HR 630 USban	RVPw	BasU	HR 630 USban	HR 630 Alk-zero	BasU	BasU	HR 630 USban	HR 630 Alk-zero
	7	2	2	7	8	2	3	4	8	2	3
COSTS											
Total Average Cost (¢/gal.)	4.0	12.8	7.5	-0.8	2.7	5.1	4.3	3.5	2.1	2.5	1.5
Variable Cost	2.2	10.7	7.3	-2.2	-0.4	3.0	0.0	2.0	-0.5	1.9	-0.6
Refinery Capital Charge	0.0	0.7	0.0	0.2	2.4	2.3	4.8	0.6	1.9	1.3	2.9
Ancillary Refining Cost	0.4	1.8	1.2		0.4	0.9	0.8	0.5	0.3	0.6	0.4
Logistics Cost											
Mileage Loss	1.4	-0.5	-1.0	1.2	0.4	-1.1	-1.3	0.4	0.4	-1.3	-1.3
Total Seasonal Cost (\$ million)	290	1,010	590	-70	220	420	340	270	160	210	120
Variable Cost	160	850	580	-180	-30	250	0	150	-40	160	-50
Refinery Capital Charge	0	60	0	10	190	190	380	50	150	110	230
Ancillary Refining Cost	30	140	90		30	70	60	40	20	50	40
Logistics Cost											
Mileage Loss	100	-40	-80	100	30	-90	-100	30	30	-110	-100
Refinery Investment (\$million)	7	408	3	83	1,218	1,240	2,473	326	989	708	1,508
IMPORTS/EXPORTS (K bbl/d)											
Oxygenates	113	5	5	123	98	5	12	85	100	5	21
MTBE	16			21	18		12		20		21
Ethanol	97	5	5	103	79	5		85	79	5	
TBA											
ETBE											
TAME											
Other Imports	26	486	424	11	46	260	110	98	33	204	79
Isobutane	4	15	9		35	44	99	12	22	12	47
Alkylate	21	86	86	11	11	86	11	86	11	87	11
CARBOB		328	265			130				105	20
Jet Fuel & EPA Diesel		58	64								
Rejected Blendstocks	12	217	179	0	44	50	29	71	43	30	4
Mixed Butylenes			6		4	44	29	27	3	29	4
Pentanes		2	0		25	0		25	25		
Light Coker Naphtha											
Light FCC Gasoline		6	9		15	5		19	15	1	
Heavy FCC Gasoline	12	12	9								
Naphtha (250 - 325 °F)		171	153								
Heavy Reformate		27									
CAPACITY UTILIZATION (%)											
Crude Distillation	93	87	87	98	100	93	99	100	100	95	100
Conversion	92	87	86	97	98	91	98	98	99	94	98
Upgrading	75	71	69	81	86	94	99	86	85	96	99

Appendix A: Properties of Oxygenates for Refinery Modeling

Oxygenate	Distillation (% Off)										RVP (psi)	Oxygen (wt%)	Aromatics (vol%)	Benzene (vol%)	Olefins (vol%)	Sulfur (ppm)	En. Den. (MM btu/b)	Octane (R+M)/2
	100°	130°	175°	200°	212°	257°	280°	300°	356°									
MTBE																		
Merchant	6	22	107	112	115	113	112	111	100	8	18.2	0	0	0.2	10	4.275	110	
Captive	6	22	107	112	115	113	112	111	100	8	18.2	0	0	0.2	50	4.275	110	
Ethanol																		
2.1 wt% Oxy Blending	0	81	237	112	108	107	106	105	102	--	34.8	0	0	0	2	3.551	115	
2.7 wt% Oxy Blending	0	70	209	120	110	109	107	106	102	--	34.8	0	0	0	2	3.551	115	
3.5 wt% Oxy Blending	0	59	181	132	116	109	106	104	103	--	34.8	0	0	0	2	3.551	115	
TBA	0	0	100	107	110	107	105	103	100	9	21.6	0	0	0	0	4.278	97	
ETBE	0	0	100	103	107	113	112	111	100	4	15.7	0	0	0.2	0	4.296	112	
TAME	0	0	104	105	105	105	104	103	100	2	15.7	0	0	0.2	50	4.551	105	